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DATA RECORD OF CURRENT OBSERVATIONS VOLUME XVII

QUEEN CHARLOTTE SOUND AND HEcate STRAIT

PART 1 - WATER PROPERTY OBSERVATIONS

MAY, JULY, SEPTEMBER 1977

by R.E. Thomson, W.S. Huggett and L.S.C. Kuwahara

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DATA RECORD OF CURRENT OBSERVATIONS

VOLUME XVII

QUEEN CHARLOTTE SOUND AND HEcate STRAIT

3.1 Cruise 7 Part 1 - Water Property Observations

May, July, September 1977

3.3 Cruise 77-14 September 1977

4. Time-Series CTDs

4.1 Continuous Profile of Salinity, Temperature

4.2 Time-series Profiles of Sigma-t

5. Acknowledgments by

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Appendix A: Listings and profiles of physical properties - temperature, salinity, sigma-t and sound-speed.

Appendix B: Listings of physical properties (line-series stations - temperature, salinity, sigma-t and sound-speed).

Appendix C: Listings of dissolved oxygen data.

Appendix D: Listings of nutrient data: nitrate, phosphate and silicate.

* The horizontal sections plotted in these papers are below the acceptable publication standards. The authors take full responsibility for their poor quality.

Institute of Ocean Sciences

Sidney, B.C.

1981

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Appendix A: Listings and profiles of physical properties - temperature, salinity, sigma-t and sound speed.

Appendix B: Listings of physical properties time-series stations - temperature, salinity, sigma-t and sound-speed.

Appendix C: Listings of dissolved oxygen data.

Appendix D: Listings of nutrient data: nitrate, phosphate and silicate.

* The horizontal sections plotted in this report are below the acceptable publication standards. The authors take full responsibility for their poor quality.

Abstract

This volume presents water property data for the Queen Charlotte Sound - Hecate Strait region collected during May, July and September 1977. Areas covered are Queen Charlotte Sound, southern Hecate Strait, Laredo Sound, Caamaño Sound, Principe Channel and Browning Entrance. Data include temperature, salinity, density, sound speed, dissolved oxygen and dissolved nutrients (silicate, phosphate and nitrate).

Part 1 presents a description and preliminary reduction of the data; Part 2 (Appendices A-D) provides listings of the data at standard depths.

1. Introduction

Queen Charlotte Sound and Hecate Strait form a broad coastal sea over the continental shelf region separating the Queen Charlotte Islands from mainland British Columbia and the north coast of Vancouver Island (Fig. 1). The sea has a combined axial length of roughly 450 km along 325°T and a maximum width normal to this direction of around 140 km. Bathymetric charts reveal a convoluted coastline of shoals and broken island groups bordering an inner continental shelf cleaved by a series of re-entrant troughs. Within the southern portion of the sea, the troughs separate a series of shallow ($\leq 100\text{m}$) banks; a major trough extends northward into Hecate Strait to the vicinity of Browning Entrance, another eastward into Queen Charlotte Strait.

This report deals primarily with water property data collected in 1977 within the exposed sectors of the region south of the northern end of Banks Island.* Limited oceanographic data is also presented for coastal channels adjoining the seaway including Caamaño Sound, Laredo Channel, Principe Channel and Browning Entrance. Surveys cover one-week periods in May, July and September 1977. Data, as obtained from CTD (conductivity/temperature/depth) and hydro-cast profiles, consist of temperatures, salinities, densities (σ_t), sound speeds, nutrients and dissolved oxygen contents.

These data are presented in three ways: as horizontal sections at standard depths; as vertical profile plots with accompanying listings at standard depths; and as time series observations at fixed locations where applicable.

Additional information regarding the oceanography of the region is found in Volume XVIII of this series and in the comprehensive reviews by Dodimead (1980) and Tabata (1980). A study of wind-generated inertial oscillations appears in Thomson and Huggett (1981).

* Volume XVIII deals with the tides and currents data. A preliminary analysis and interpretation of major oceanographic features in the region is to appear in a later volume.

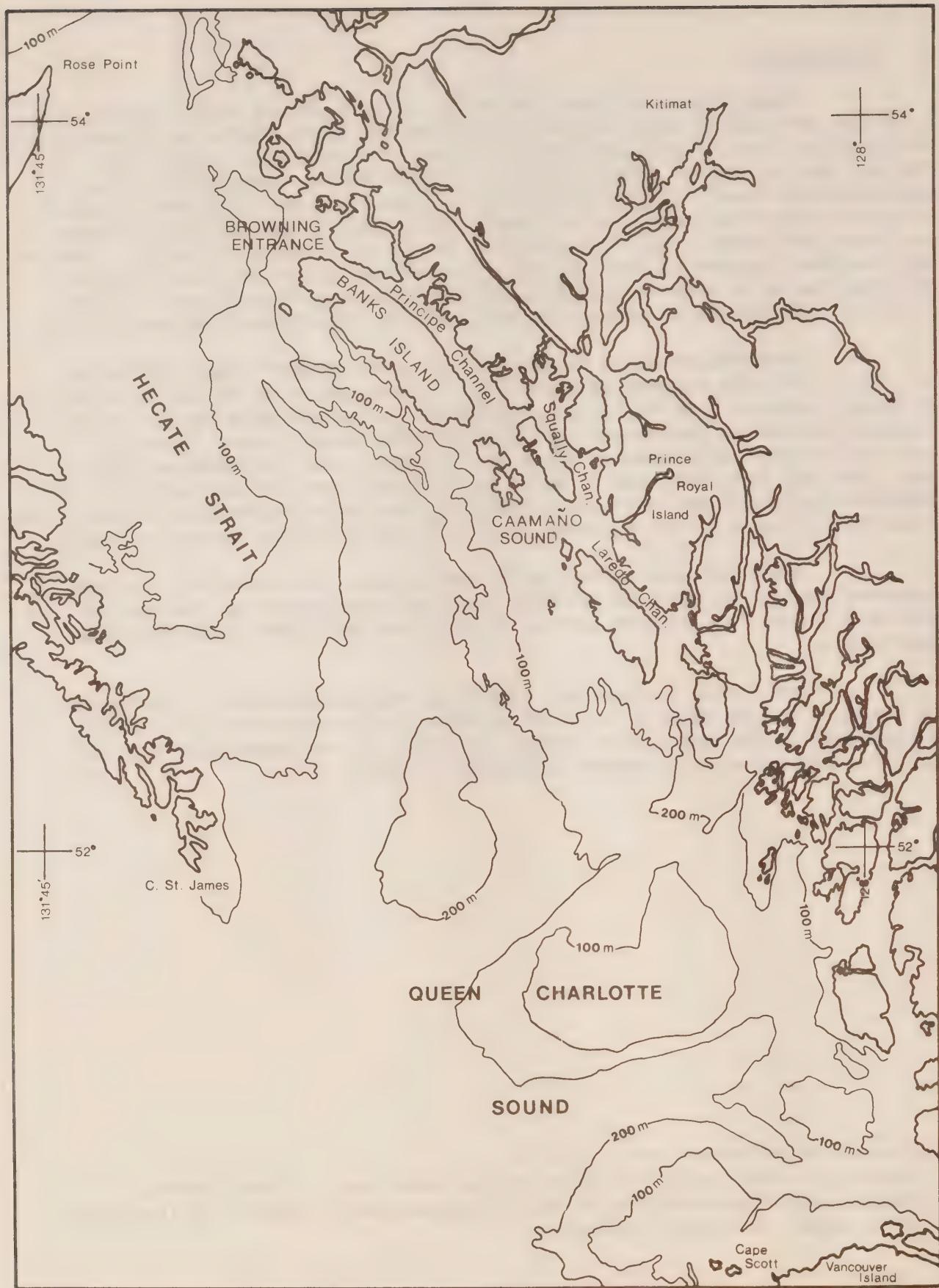


FIG. 1

2. Data collection and processing

Water property measurements were obtained at fixed stations (Fig. 2) from separate CTD and Niskin bottle (hydro) casts. The CTDs allowed rapid "continuous" profiling of the temperature and salinity structure while the water bottles provided both calibration data for the CTD and samples for determination of nutrients and dissolved oxygen content. Water property surveys were coincident with moored current meter records reported in Volume XVIII of this series (Huggett et al, 1981) and were generally confined to the deeper portions of the region. Moreover, observations typically consisted of single profiles at each station. Exceptions were: a short (4 hr.), hourly time-series at station QD10 on 22 May; a series of six along-channel stations in Laredo Sound and Caamaño Sound from 17-18 July; a series of four stations in Principe Channel on 18 July; a 24-hour time-series at station QD30 beginning 20 July; a series of stations in Laredo Sound on 22 and 27 September; and a series of six stations along Principe Channel and across Caamaño Sound from 24-26 September.

Table 1 lists the dates and identification numbers for the various cruises together with the main region of study and the names of the research vessels. Station names and geographical locations for the CTD, hydro and time-series observations are presented in Table 2. Positions are also given in the header for each CTD station listed in the Appendices. Station locations are also plotted in Figure 2.

CTD Observations

Profiles of water properties were obtained using a 8700-series Guildline CTD lowered from the stern of the research vessel via a 5/16" (8 mm) diameter, 7-conductor armograph cable. Output from the probe consisted of analogue voltages of temperature, conductivity and pressure calibrated for the full-scale ranges of 0 to 25°C, 0 to 40‰ and 0 to 1500 dbar, respectively. The probe output was connected to a Guildline deck unit where part of the signal was converted to temperature, salinity and pressure values for plotting on calibrated graph paper. These traces provided real-time displays of the temperature and salinity profiles and served as back-up to the tape storage system. The remaining branch of the output signal was input into a 2100-series HP computer, digitized at a rate of 10 samples per second and stored on a 9-track magnetic tape through a HP7970B digital tape unit. For variable rates of probe descent from 0.5 to 1.5 ms^{-1} this yielded vertical scale resolutions of order 10 cm. As well as being recorded on tape, digitized records were converted and listed every 5 m on a teletype (or high speed printer). This allowed real-time monitoring of tape recorded data and enabled the operator to safely lower the probe to within a few metres of the seafloor. During each cruise, the absolute zero-depth voltage offset was established with the temperature and conductivity sensors a few centimetres below the sea surface in flat calm conditions. The offset was subtracted from subsequent pressure voltages.

Following each cruise, the raw voltages were converted to temperature, salinity and pressure and the data edited. For combined CTD and hydro cast stations, standard depth values were compared and correction curves for the CTDs determined. Results from these comparisons are presented in Figure 3. Although the standard deviations were significant in most cases



FIG. 2

TABLE 1. Cruise identification number versus period of CTD-hydro observations, principal region of study and research vessel.

<u>CRUISE ID</u>	<u>OBSERVATION PERIOD</u>	<u>PRINCIPAL REGIONS OF INVESTIGATION</u>	<u>RESEARCH VESSEL</u>
77-12	17-22 May 1977	Queen Charlotte Sound	CSS Parizeau
77-13	14-22 July 1977	Queen Charlotte Sound Laredo Sound Principe Channel Caamaño Sound	CNAV Endeavour
77-14	20-27 Sept. 1977	Queen Charlotte Sound Laredo Sound Principe Channel	CSS Parizeau

TABLE 2. Names, locations and depths of CTD/hydro stations occupied from May 1977 to September 1977. An 'x' in the last three columns signifies types of observations at each station. QD = Queen Charlotte Sound LS = Laredo Sound PC = Principe Channel SC = Squally Channel. Water depths can vary more than ± 20 m in the vicinity of a given station.

STATION ID	LATITUDE ($^{\circ}$ N)	LONGITUDE ($^{\circ}$ W)	DEPTH (m)	APPROX.	STD	HYDRO	TIME SERIES
QD1	51 $^{\circ}$ 00'.7'			127 $^{\circ}$ 54.9'		x	x
QD2	51 $^{\circ}$ 25.0			128 $^{\circ}$ 35.0		x	x
	51 $^{\circ}$ 15.0			128 $^{\circ}$ 42.0		x	x
QD3	51 $^{\circ}$ 14.0			129 $^{\circ}$ 05.8		x	x
	51 $^{\circ}$ 15.0			129 $^{\circ}$ 03.0		x	x
QD4	51 $^{\circ}$ 00.0			129 $^{\circ}$ 16.0		x	x
QD5	51 $^{\circ}$ 00.0			129 $^{\circ}$ 17.0		x	x
QD6	51 $^{\circ}$ 22.8			130 $^{\circ}$ 05.0		x	x
	51 $^{\circ}$ 19.6			130 $^{\circ}$ 03.0		x	x
QD7	51 $^{\circ}$ 13			130 $^{\circ}$ 04.9		x	x
	51 $^{\circ}$ 20.0			130 $^{\circ}$ 03.0		x	x
	51 $^{\circ}$ 25.0			130 $^{\circ}$ 34.5		x	x
QD8	51 $^{\circ}$ 15.0			129 $^{\circ}$ 03.0		x	x
QD9	51 $^{\circ}$ 44.5			130 $^{\circ}$ 47.0		x	x
	52 $^{\circ}$ 04.5			130 $^{\circ}$ 31.0		x	x
	52 $^{\circ}$ 03.9			130 $^{\circ}$ 16.0		x	x
QD10	52 $^{\circ}$ 04.0			130 $^{\circ}$ 31.0		x	x
QD11	52 $^{\circ}$ 16.5			130 $^{\circ}$ 16.0		x	x
	52 $^{\circ}$ 20.3			129 $^{\circ}$ 40.3		x	x
QD12	52 $^{\circ}$ 33.5			129 $^{\circ}$ 53.6		x	x
QD13	52 $^{\circ}$ 50.0			129 $^{\circ}$ 53.5		x	x
	52 $^{\circ}$ 53.5			129 $^{\circ}$ 55.9		x	x
	52 $^{\circ}$ 53.5			129 $^{\circ}$ 55.9		x	x
QD14	52 $^{\circ}$ 54.0			129 $^{\circ}$ 24.0		x	x
	52 $^{\circ}$ 54.0			129 $^{\circ}$ 00.5		x	x
	52 $^{\circ}$ 54.0			129 $^{\circ}$ 19.0		x	x

TABLE 2. (CONTINUED)

STATION ID	LATITUDE (°N)	LONGITUDE (°W)	APPROX. DEPTH (m)	STD	HYDRO	TIME SERIES
QD15	53°09.5'	130°24.0'	197	x		
QD16	53°27.5	130°45.0	161	x		
QD17	53°13.5	130°53.0	110	x		
QD18	53°00.0	131°00.0	26	x		
QD19	52°47.9	130°46.3	86	x		
QD20	52°36.3	130°33.4	157	x		
QD21	52°24.5	130°21.0	292	x		
QD22	52°02.5	129°44.0	106	x		
77-13	51°53.1	129°36.5	225	x		
77-14	51°56.0	129°31.5	229	x		
QD23	51°46.5	129°14.0	112	x		
QD30	51°19.0	128°50.0	201	x		
QD91	52°53.5	130°42.0	53	x		
LS1	52°31.4	128°52.4	230	x		
LS2	52°39.4	128°56.8	166	x		
LS3	52°43.1	129°03.0	260	x		
LS4	52°51.4	129°16.9	215	x		
PC1	53°11.9	129°38.1	201	x		
PC2	53°21.8	129°50.4	183	x		
PC3	53°31.4	130°05.0	187	x		
PC4	53°39.2	130°26.6	132	x		
SC1	53°00.7	129°16.0	355	x		
SC2	53°12.0	129°25.2	495	x		

the mean correction curves were generally within the manufacturer's specified accuracies for temperature, salinity and pressure of $\pm 0.03^{\circ}\text{C}$, $\pm 0.05\text{‰}$ and $\pm 1\%$ respectively. The variances are in part attributable to the delay of 30 to 60 minutes between the CTD and hydro casts and to the presence of vertical property gradients, especially at depths shallower than 150m.

All temperature, salinity, sigma-t and sound speed values have been derived from the hydro-corrected CTD profiles. In the horizontal property distributions in §3, only the first cast of a time-series station has been used, resulting in inordinately long durations between some adjacent stations. Similar delays were associated with the fact that current meter moorings were recovered and/or deployed during the surveys. Data from hourly time-series CTD locations are presented in §4. Listings of CTD transect data, together with profiles of salinity and temperature, are presented in Appendix A; listing of time-series CTD data appears in Appendix B.

Niskin bottle observations

Hydro-cast observations using 1.7 litre Niskin bottles at standard depths were obtained at approximately each alternate survey station roughly 30 to 60 minutes after the CTD cast. Reversing thermometers attached to each water bottle were given 5 minutes to reach *in situ* temperatures prior to release of the messenger; bottles deeper than 250 m carried both protected and unprotected thermometers so that depths could be calculated. Water samples were drawn immediately after each cast.

Dissolved oxygen samples were drawn into 125 mL flasks and immediately pickled. Samples were analyzed within 24 hours of collection using a micro-Winkler technique (de Jong, 1974) which, for the typical range of upper layer values of 4 to 6 mL/L within the main region, gave accuracies better than 1%. Dissolved oxygen values are listed in Appendix C. Nutrient samples for nitrate, phosphate and silicate were drawn unfiltered into two plastic and two glass vials and frozen in an upright position in the ship's laboratory freezer. Following the cruise, samples were analyzed using a Technicon auto-analyzer under contract to Seakem Oceanography Ltd. The data are listed in Appendix D; no time-series nutrient stations were occupied. As Macdonald et al (1980) have shown, the present nutrient collecting technique is perfectly adequate provided the proper freezing and defrosting procedures are followed and the samples are analyzed within a period of a few months of collection. A possible source of error for these nutrient data is extrusion of salts during freezing (vial too full or on its side). All nutrient data collected during Cruise 77-13 were lost when the freezer was inadvertently unplugged over a two day period.

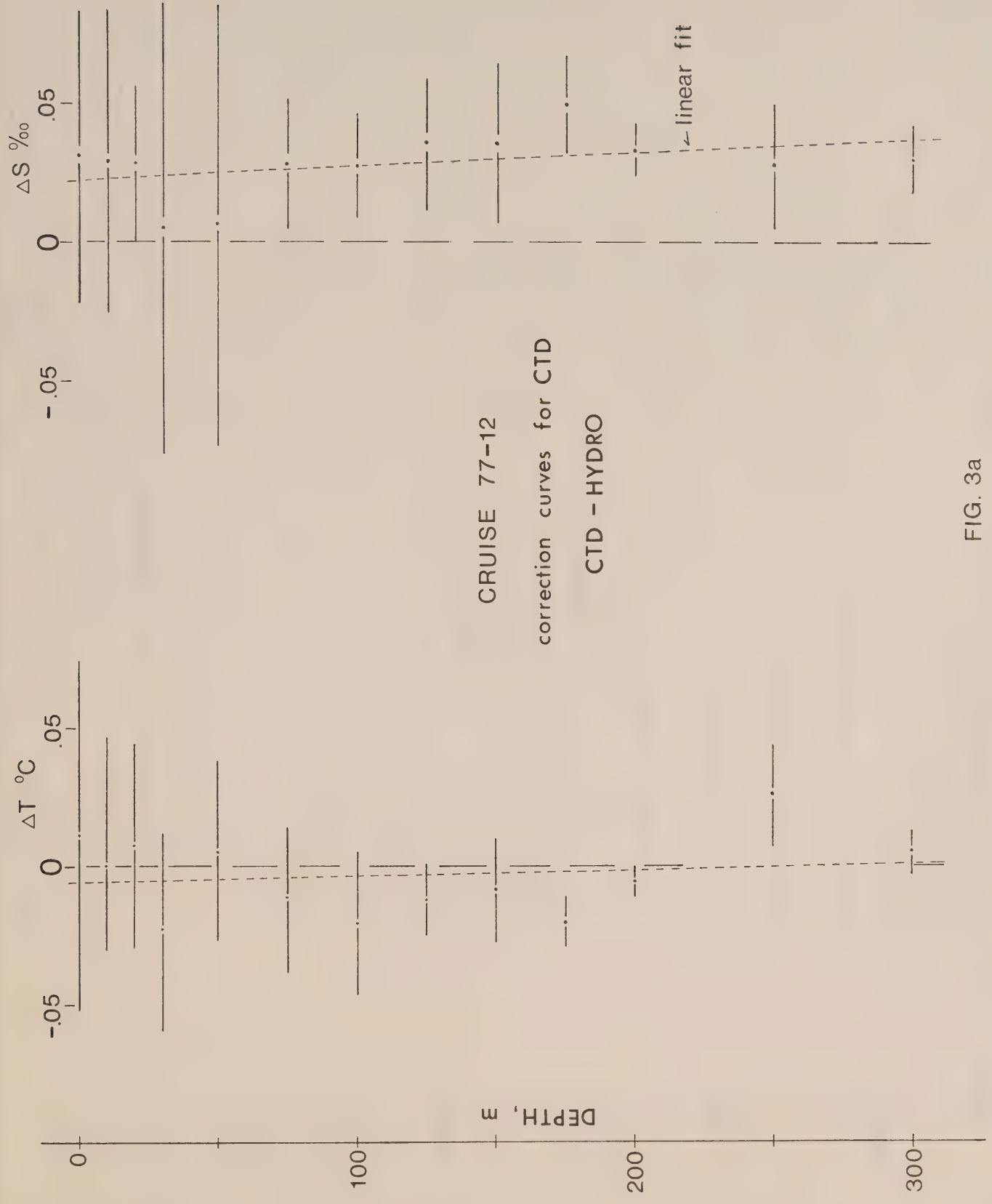


FIG. 3a

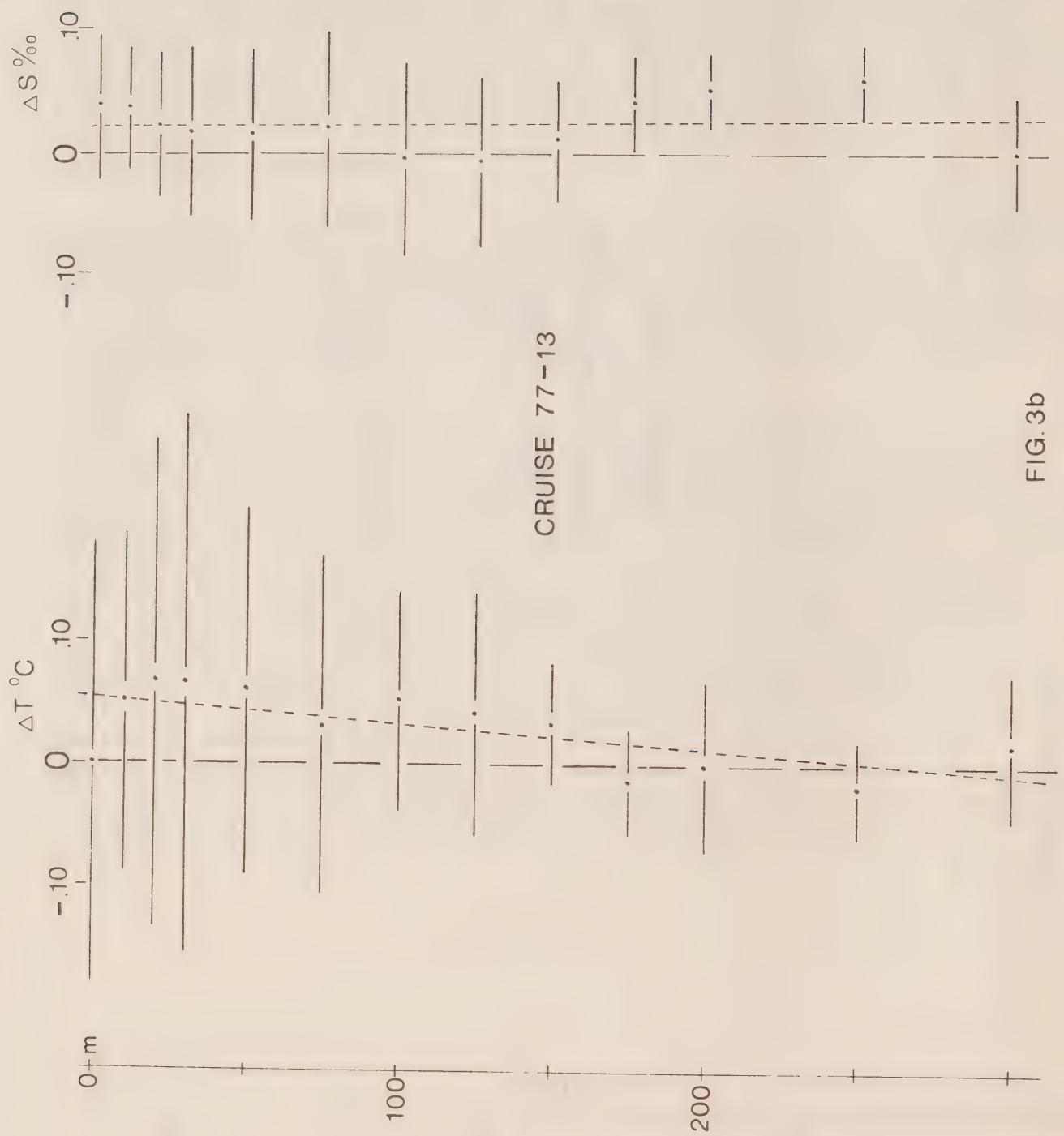
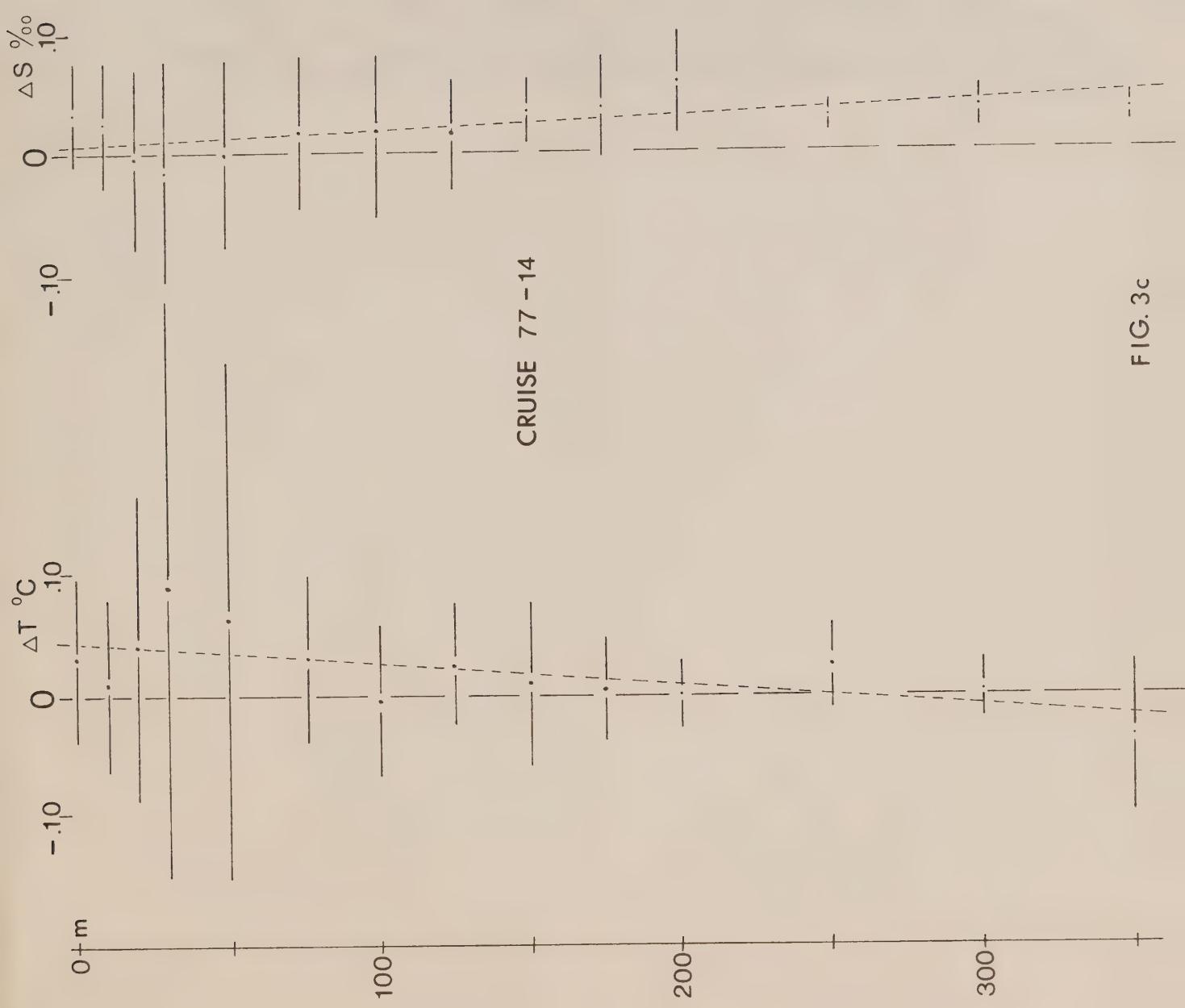


FIG. 3b



3. Horizontal sections of water properties

Plotted here are horizontal distributions of water properties based on values at standard depths for each of the three surveys. Distributions are presented in chronological order on a per cruise basis in the sequence: temperature, salinity, sigma-t, and dissolved oxygen content. The few available nutrient data have not been plotted. Sigma-t is defined as:

$$\sigma_t = \sigma_{s,t,0} = (\rho_{s,t,0} - 1) \times 10^3$$

where $\rho_{s,t,0}$ (gm cm^{-3}) is the observed density for *in situ* salinity (s) and temperature (t) adjusted to zero pressure.

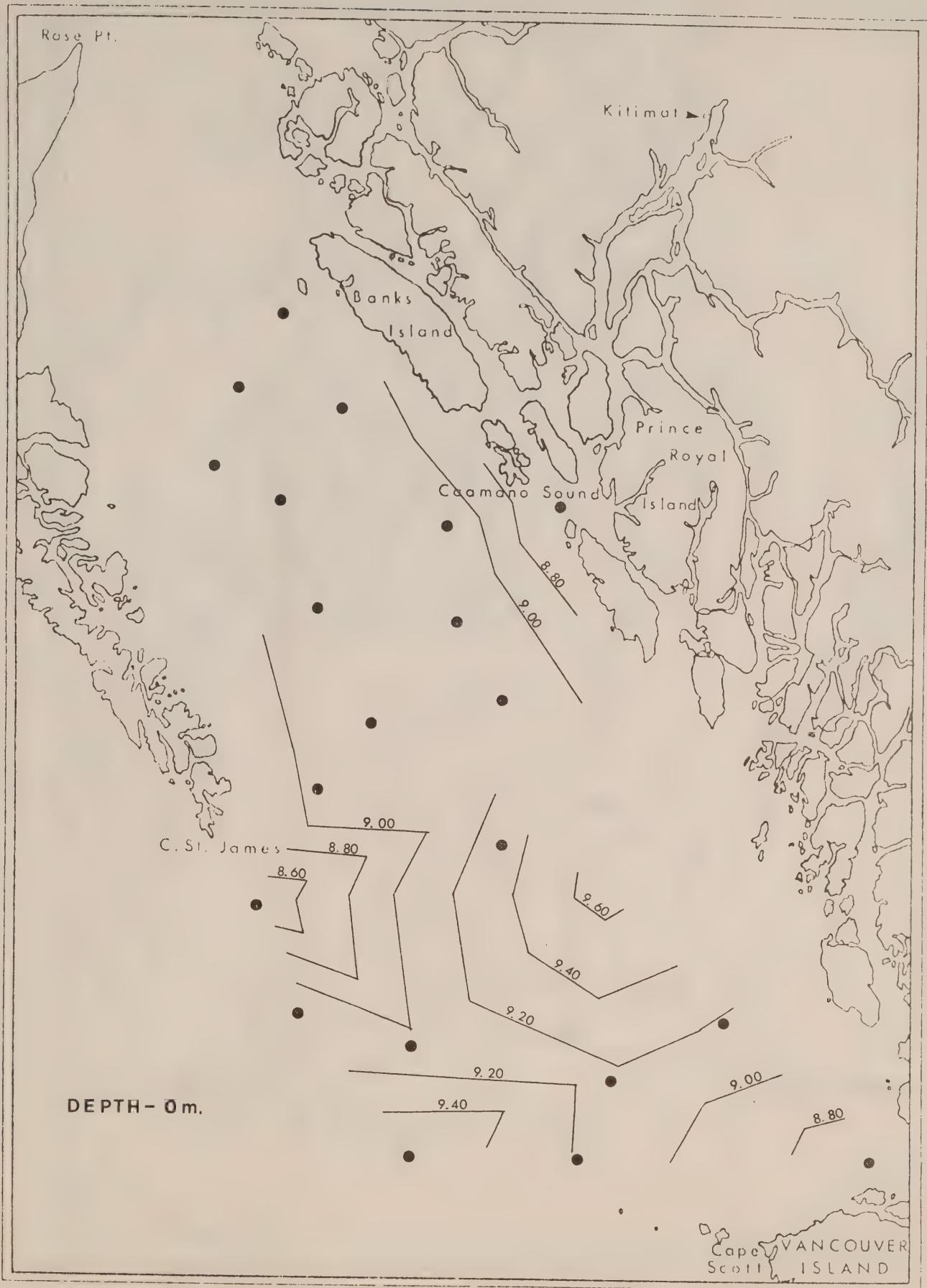
When interpreting these plots, it should be borne in mind that a given survey required a period of a few days; where the survey was interrupted to moor or redeploy current meters or to occupy a time-series station, the period between adjacent CTD stations greatly exceeded the steaming time.

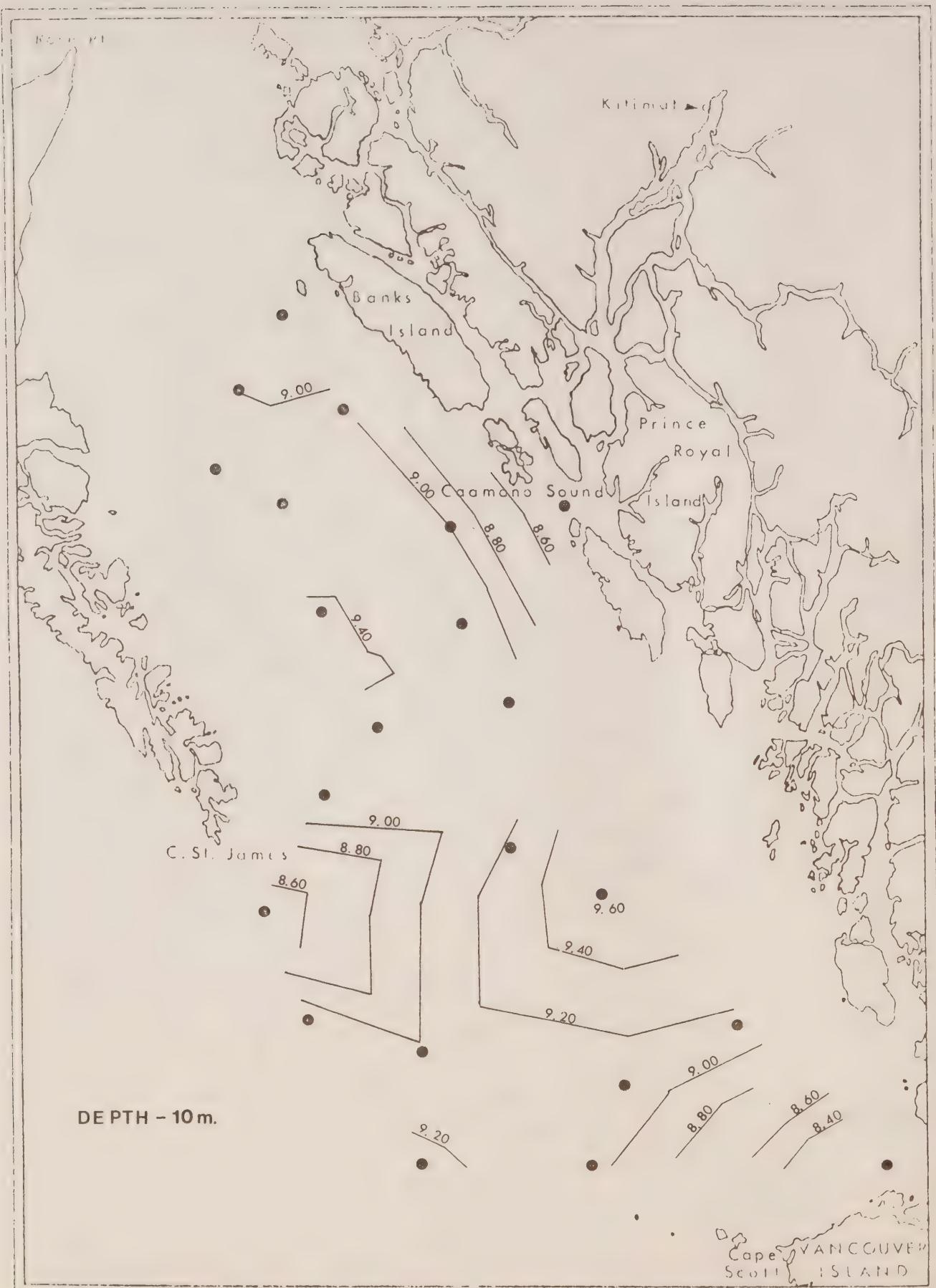
3.1 Cruise 77-12 (May 1977)

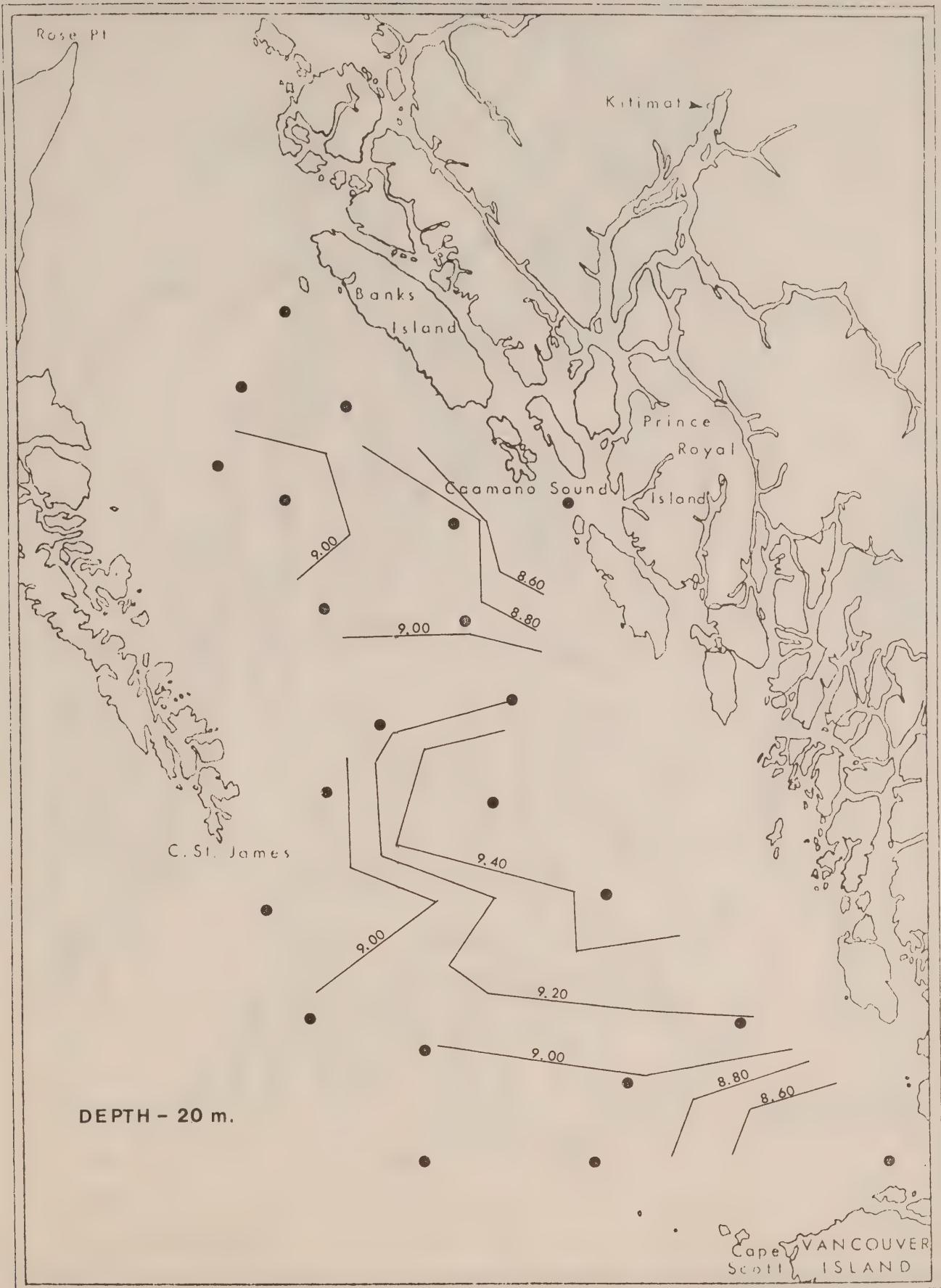
Horizontal sections of temperature, salinity, sigma-t and dissolved oxygen content.

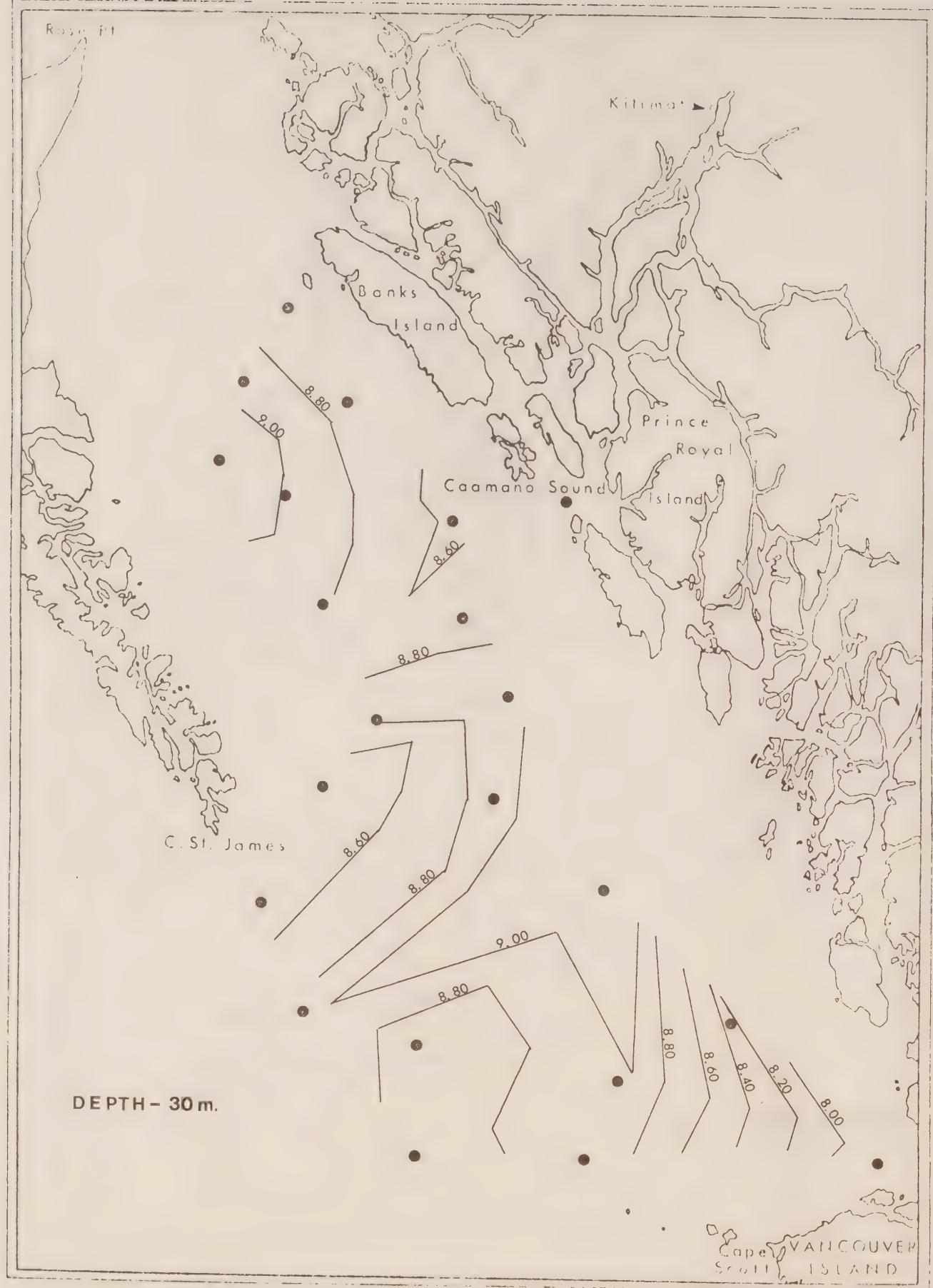
Units: temperature ($^{\circ}\text{C}$) ; salinity ($^{\circ}/\text{oo}$) ; dissolved oxygen (mL/L).

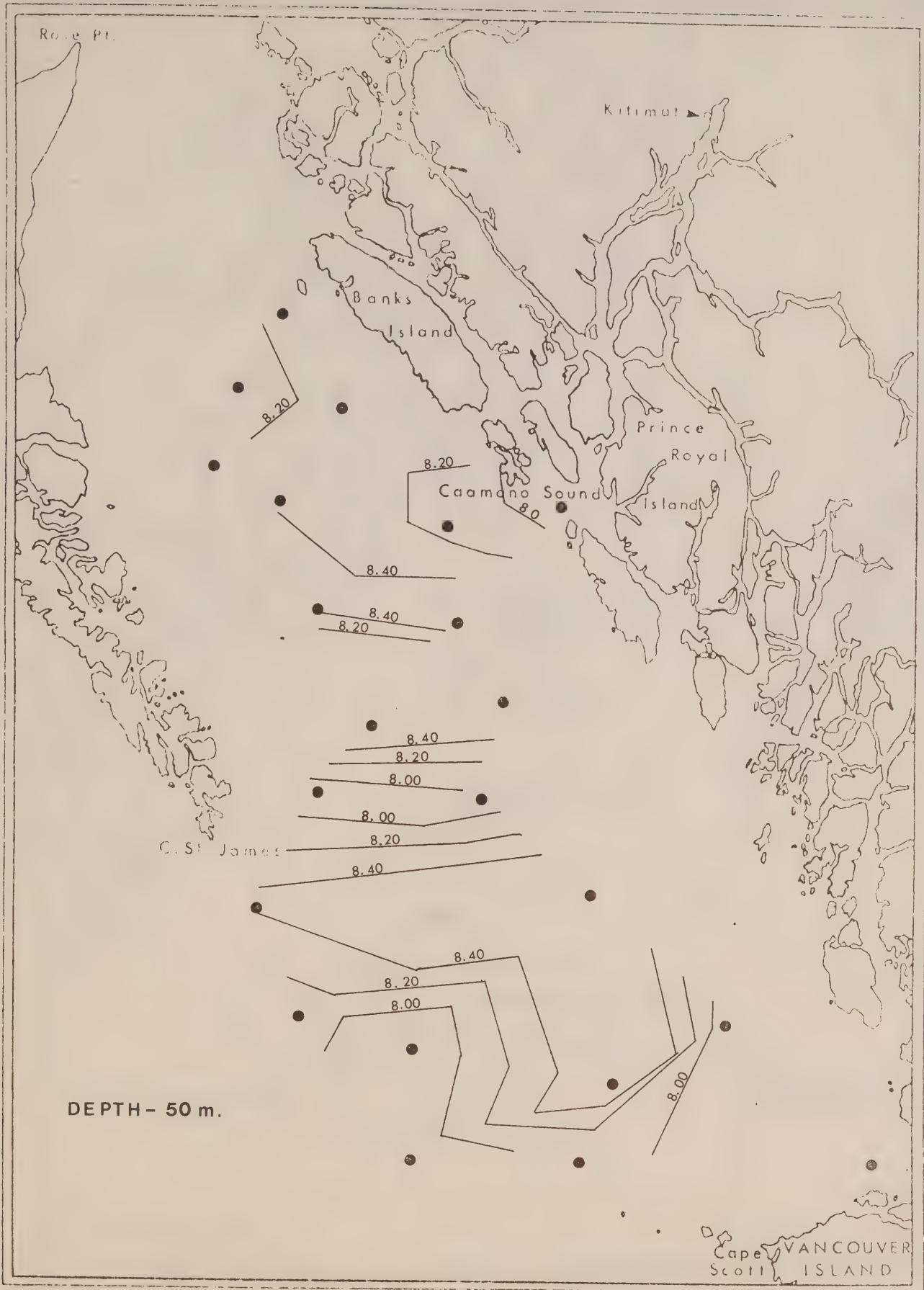
TEMPERATURE
(°C)

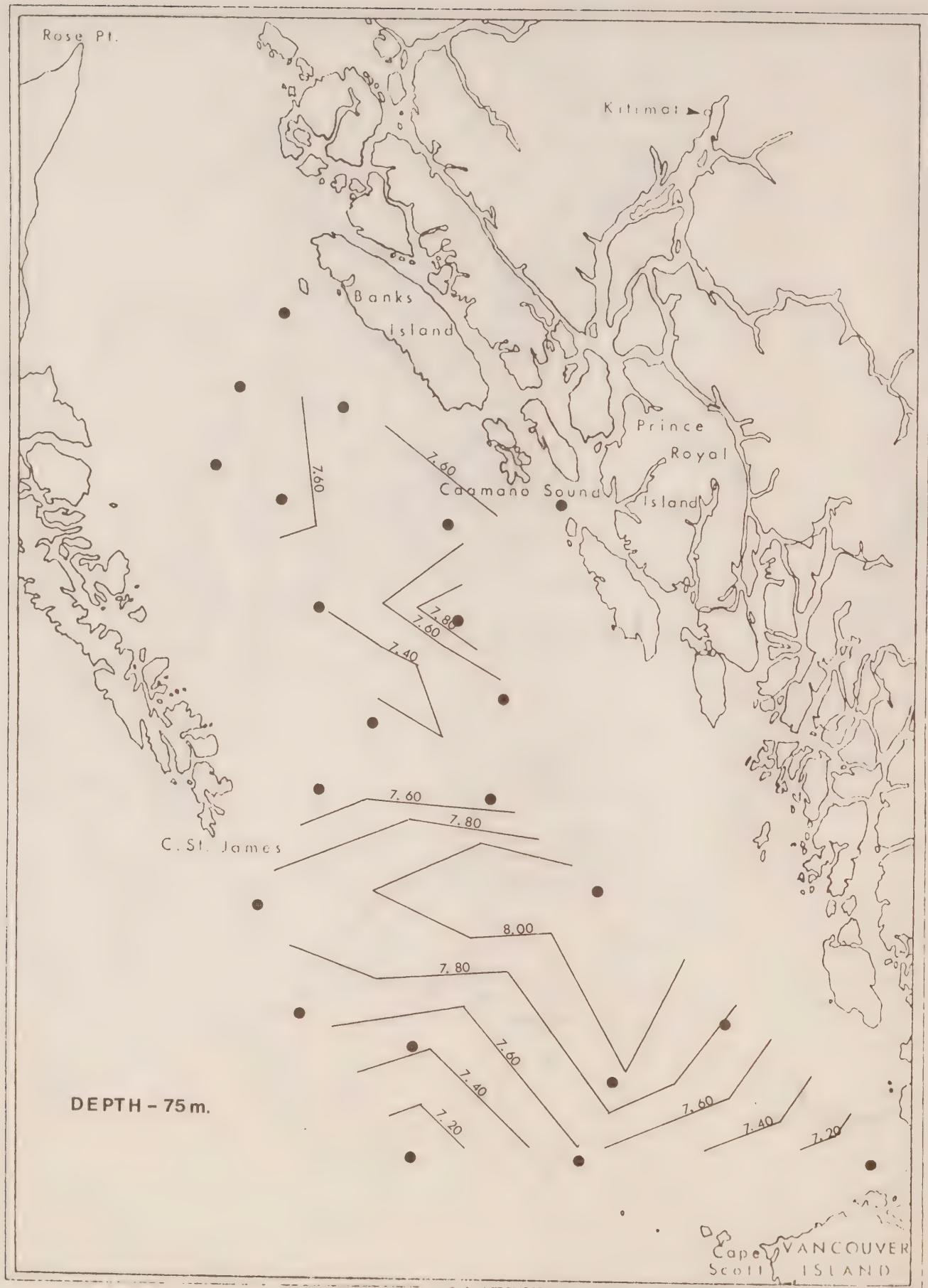


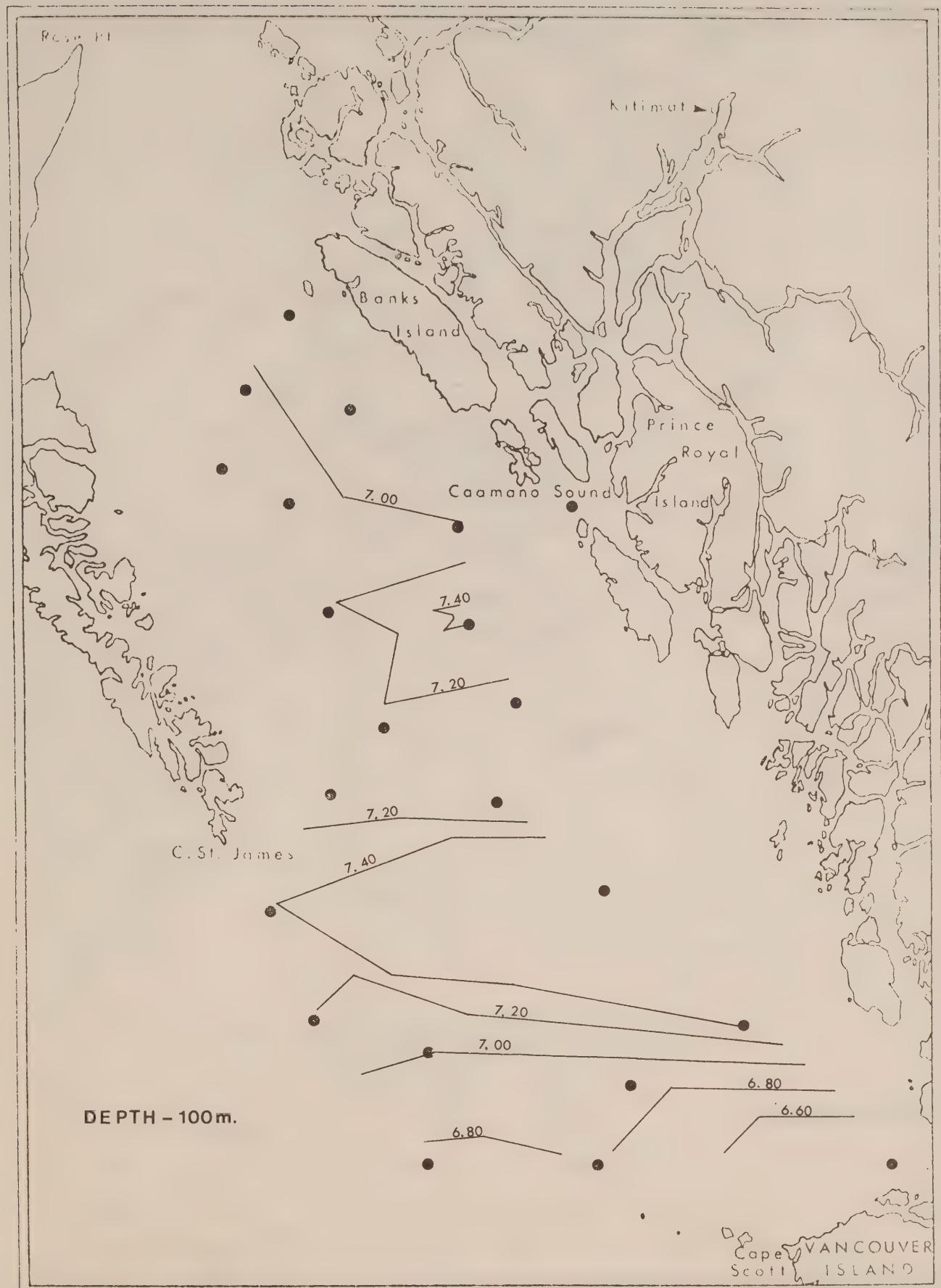


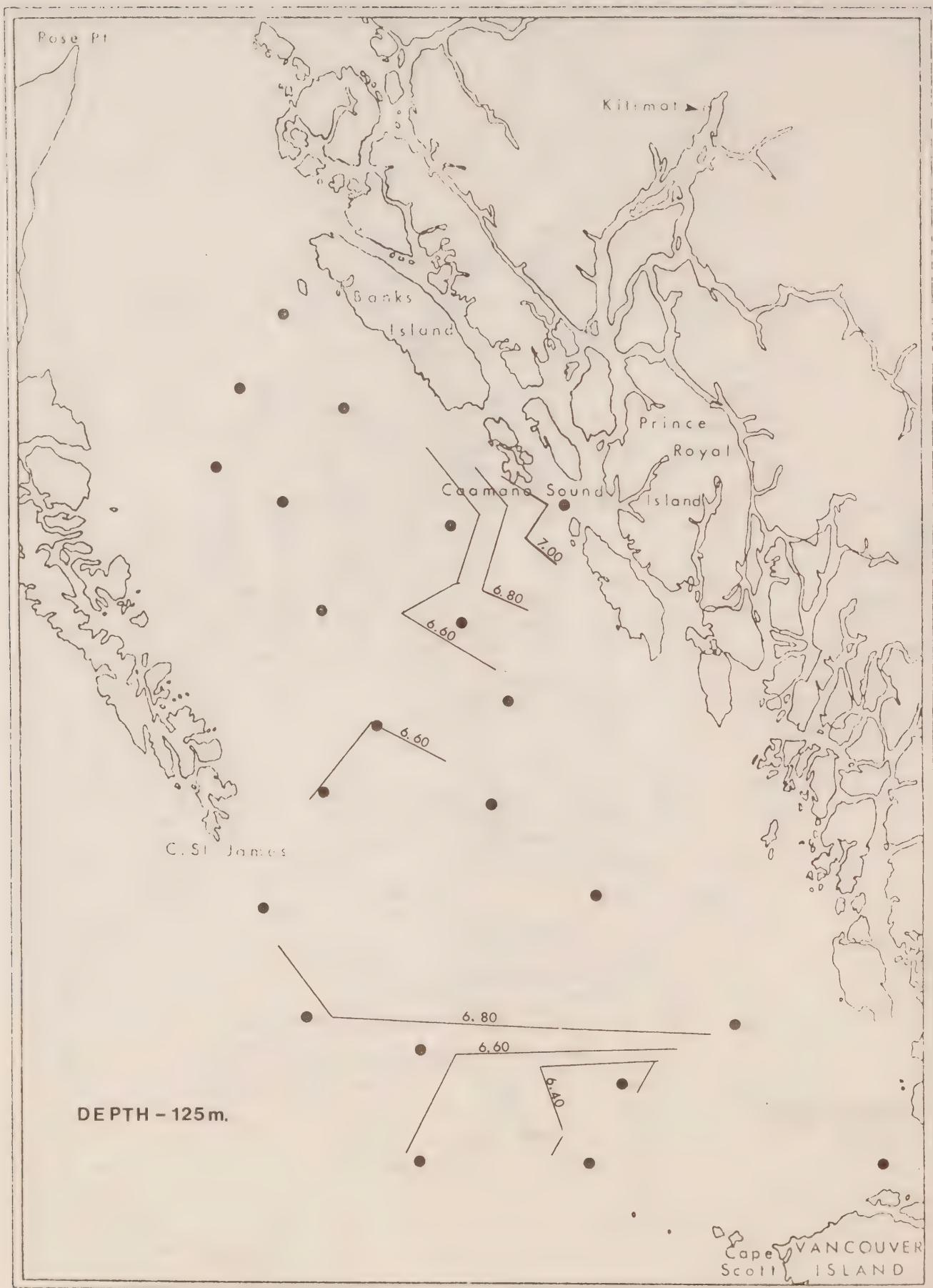


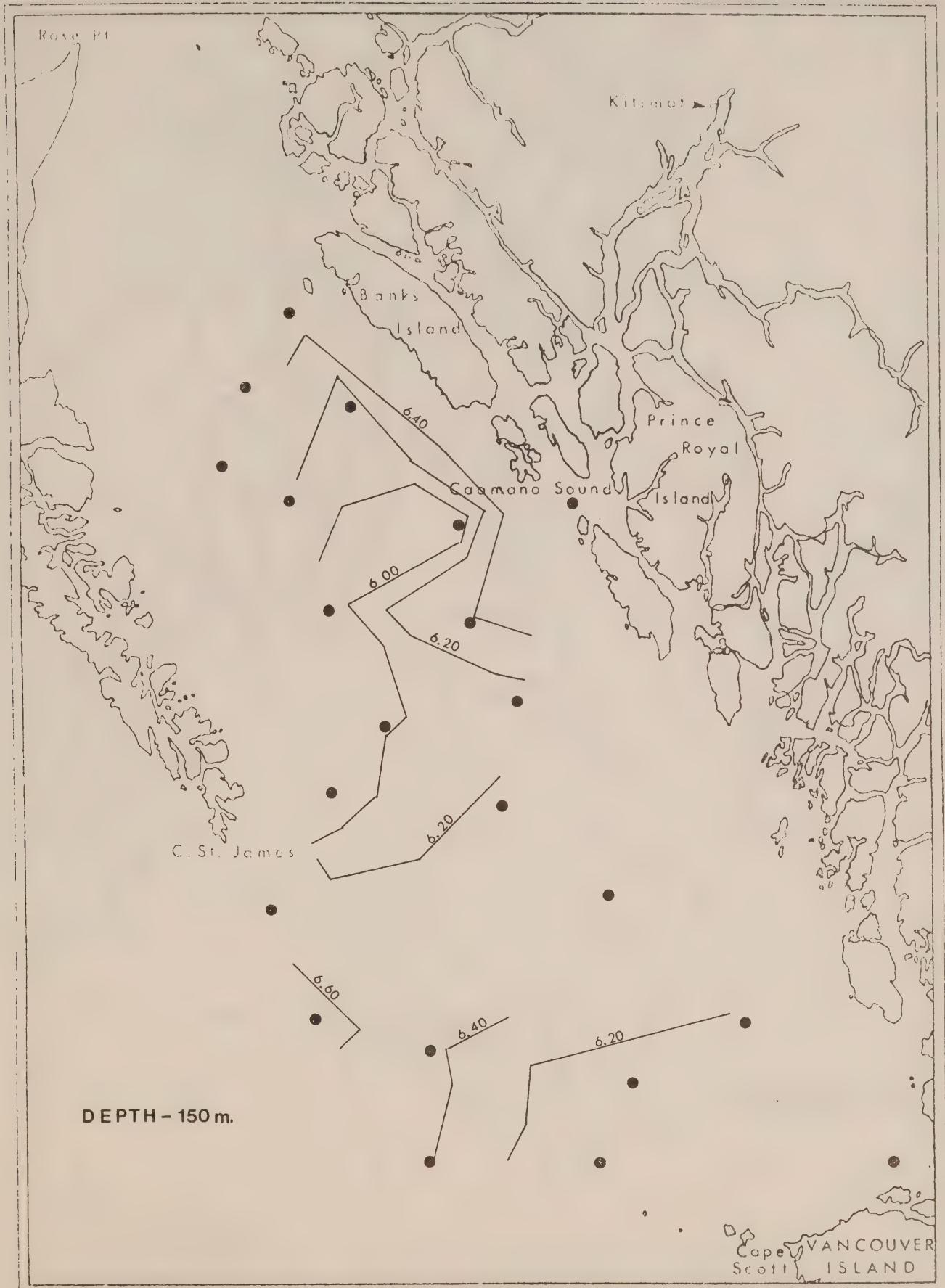


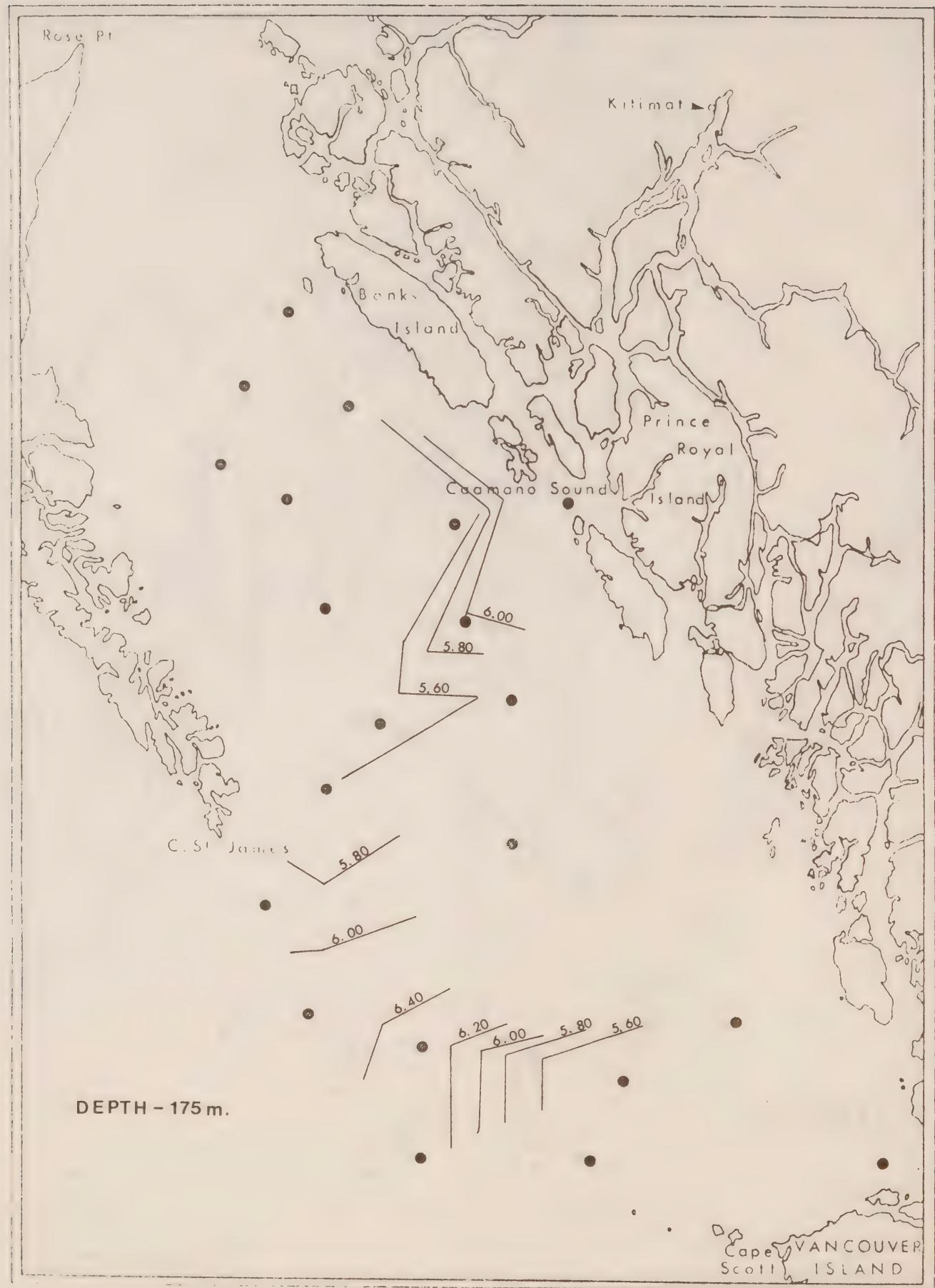


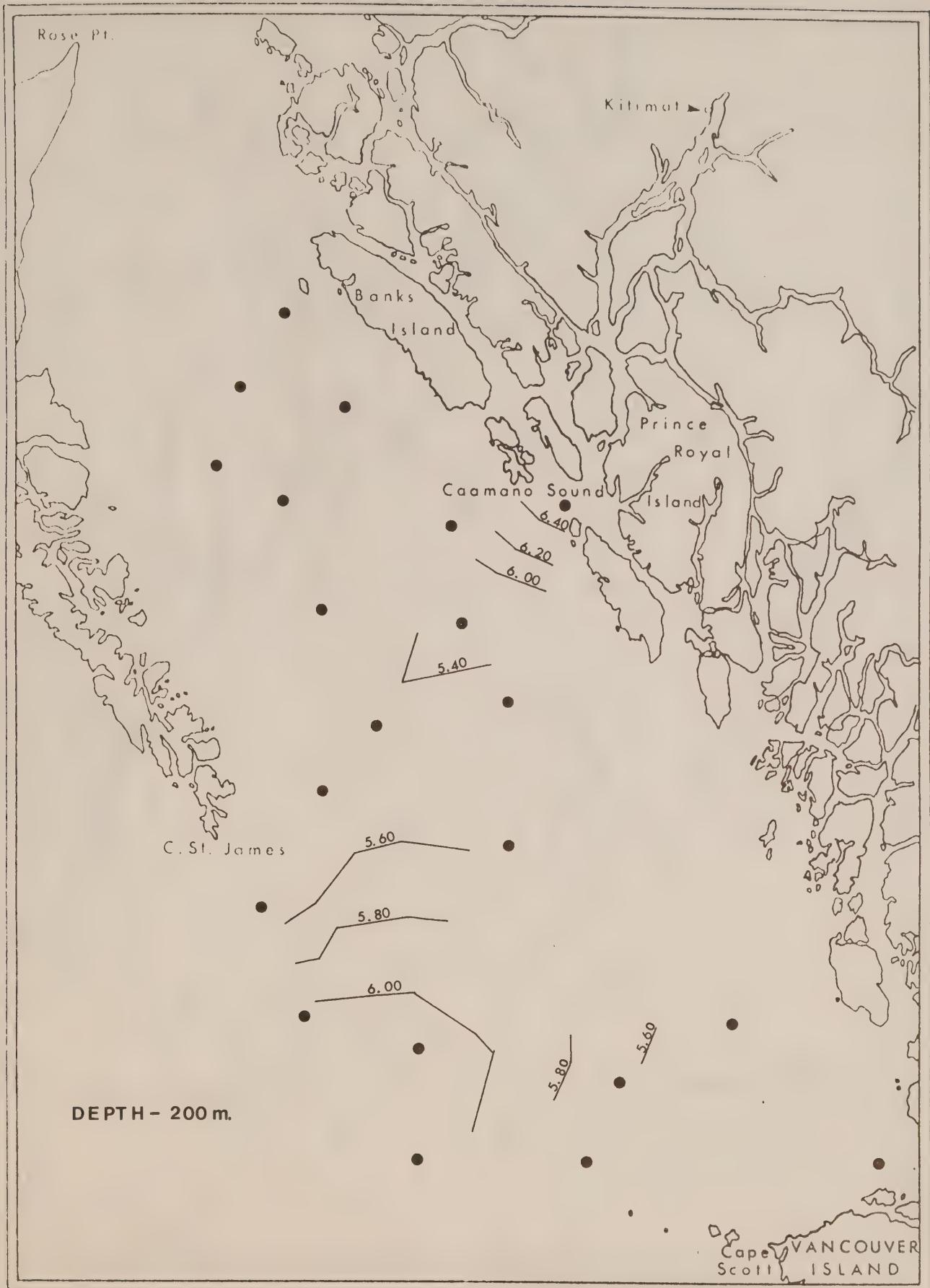


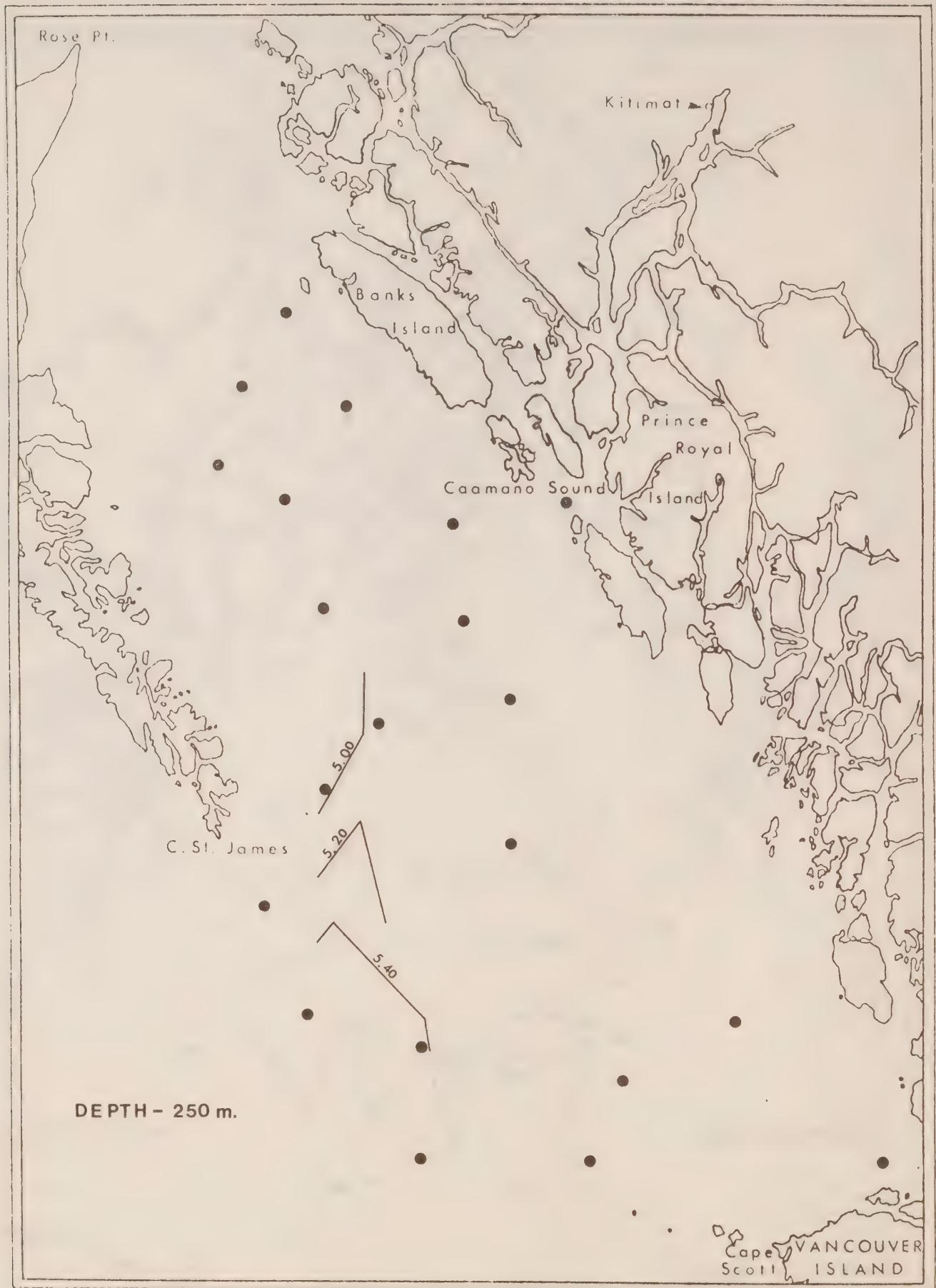


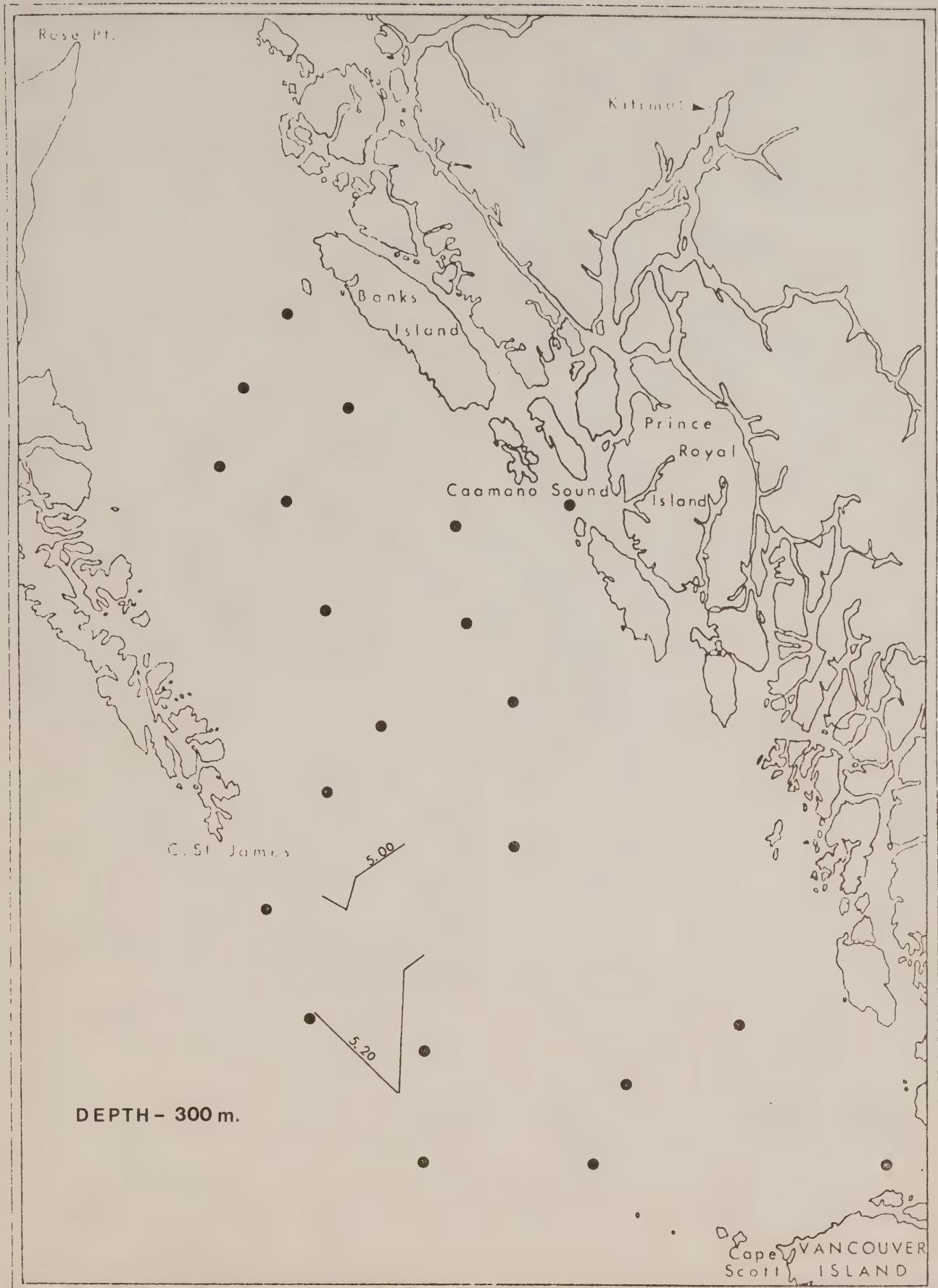


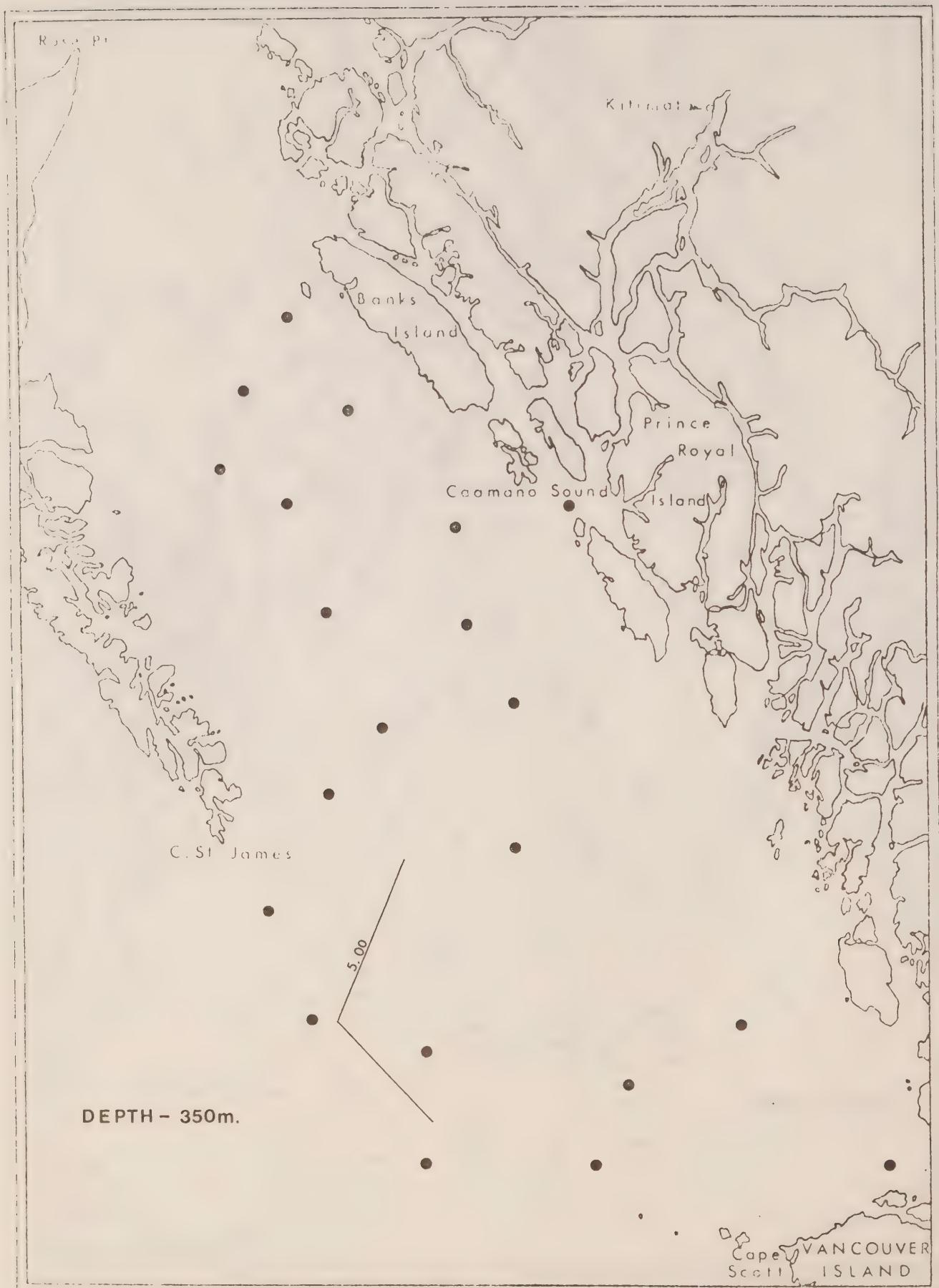




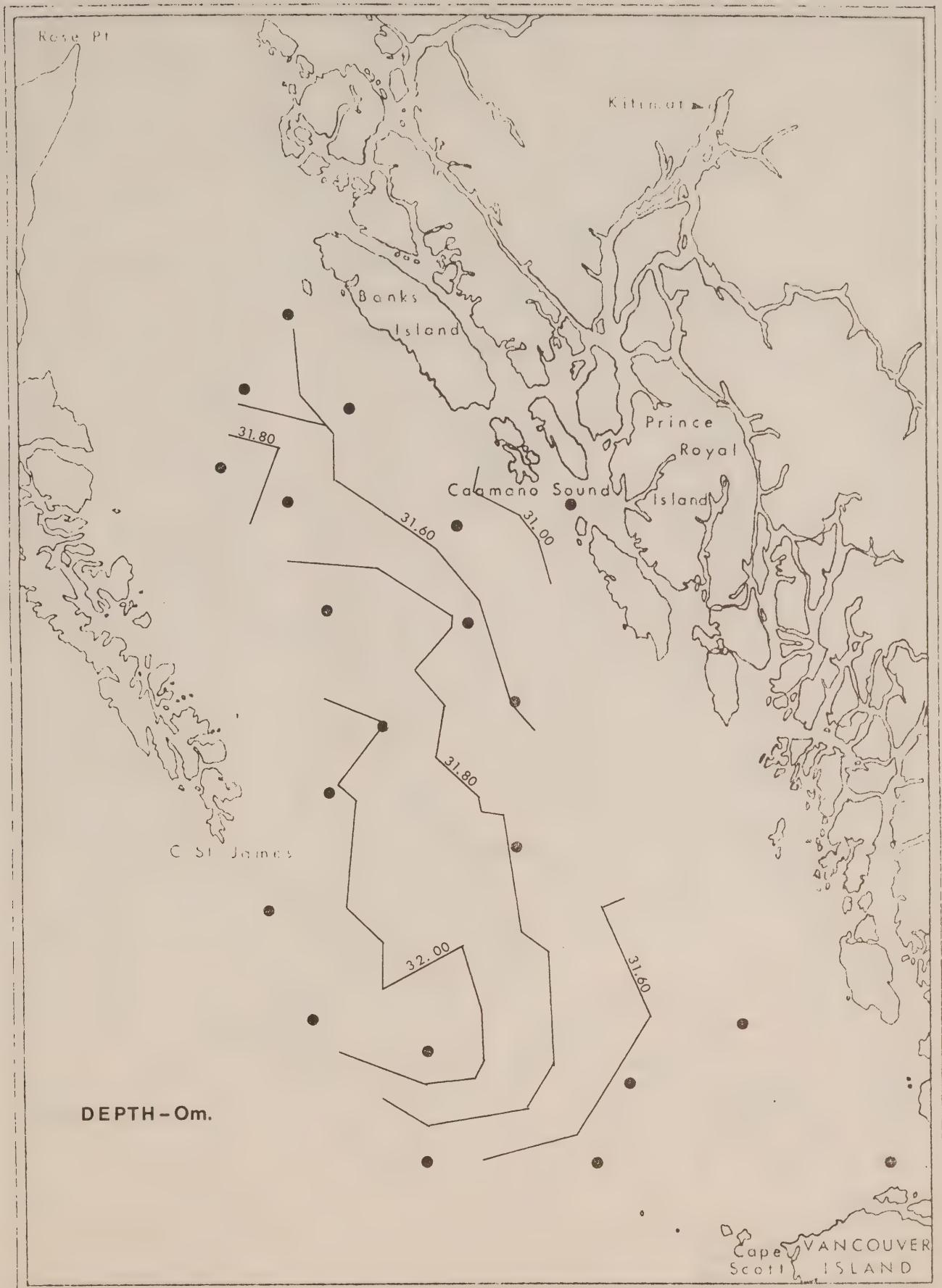


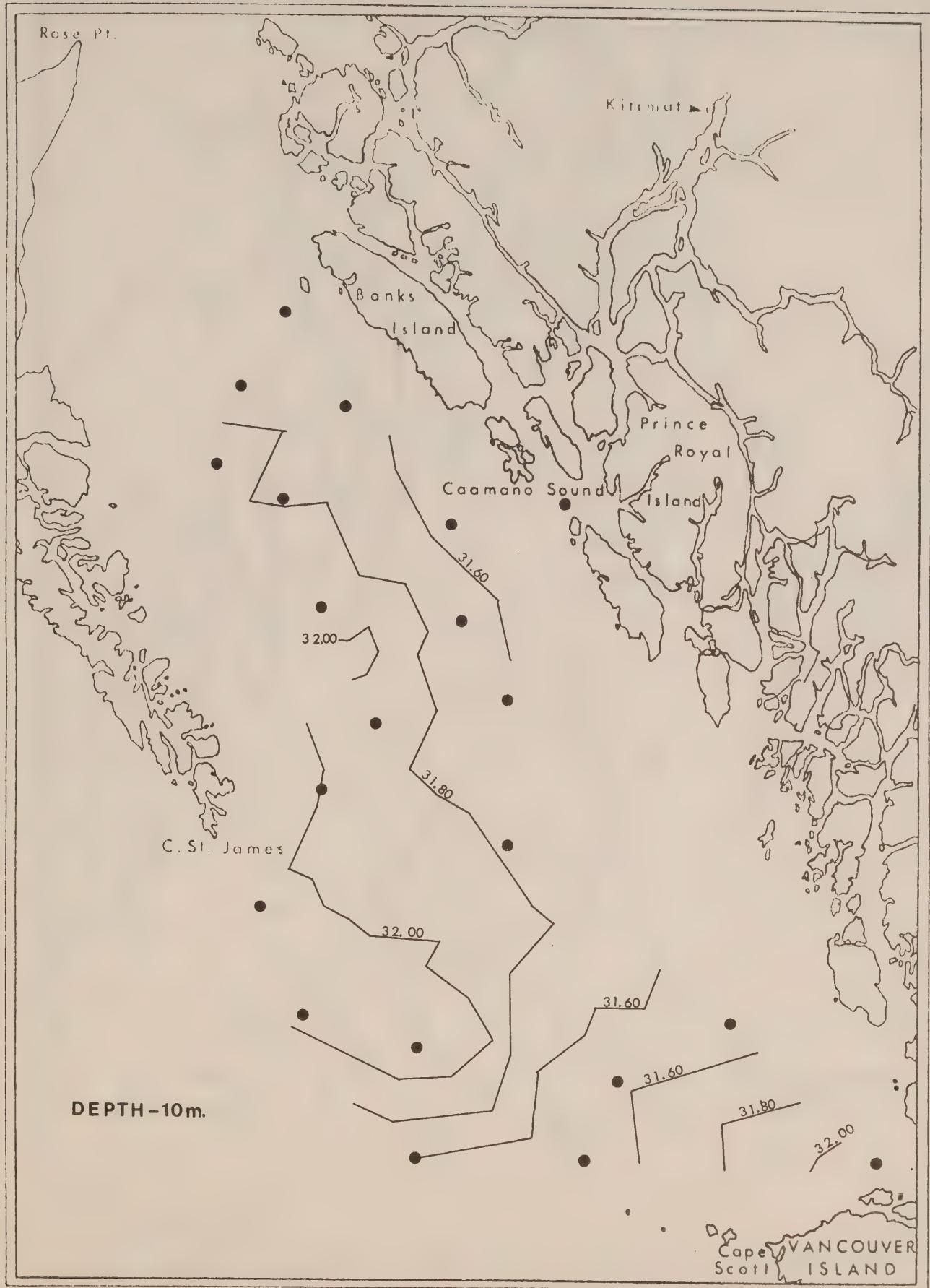




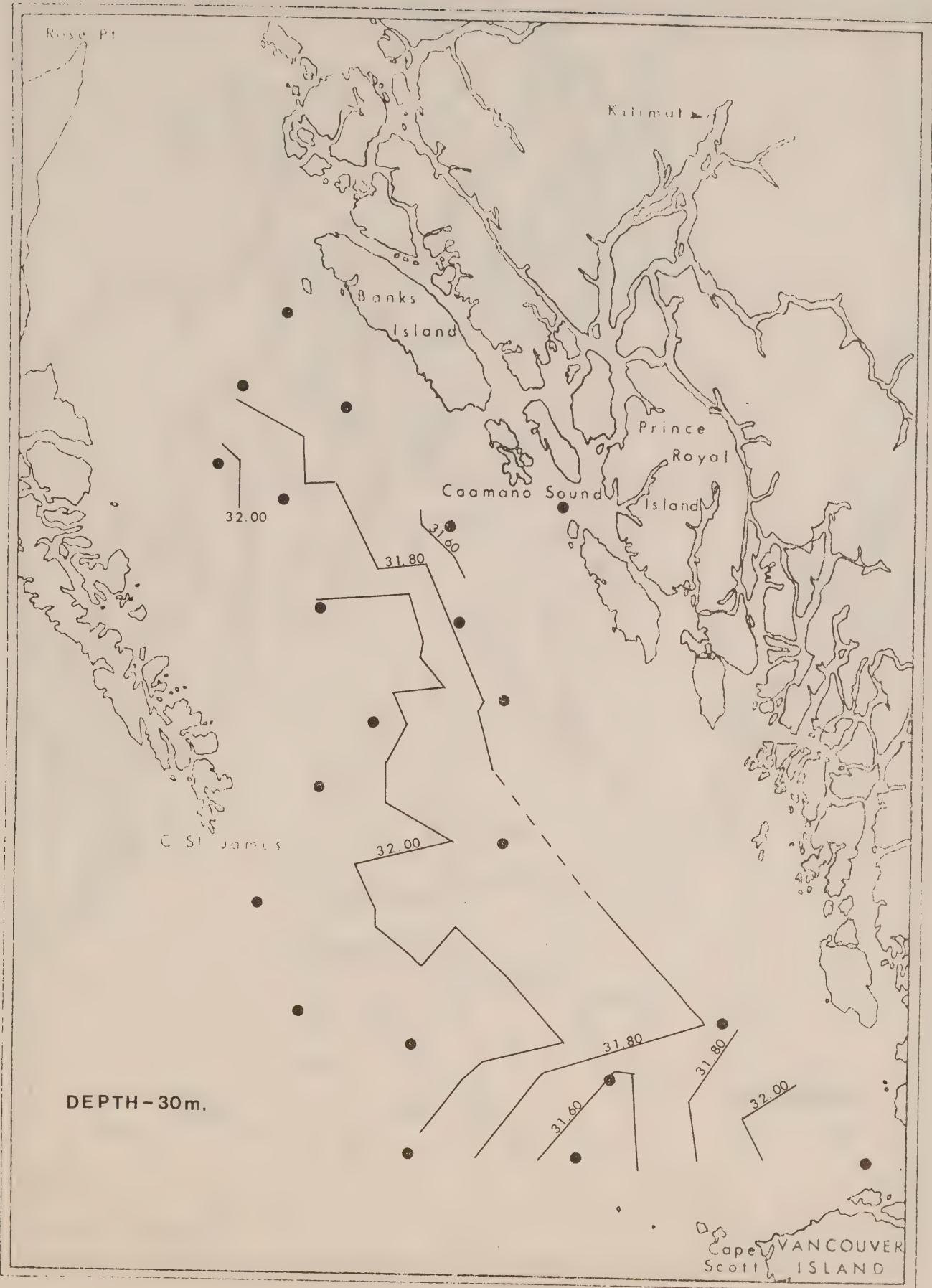


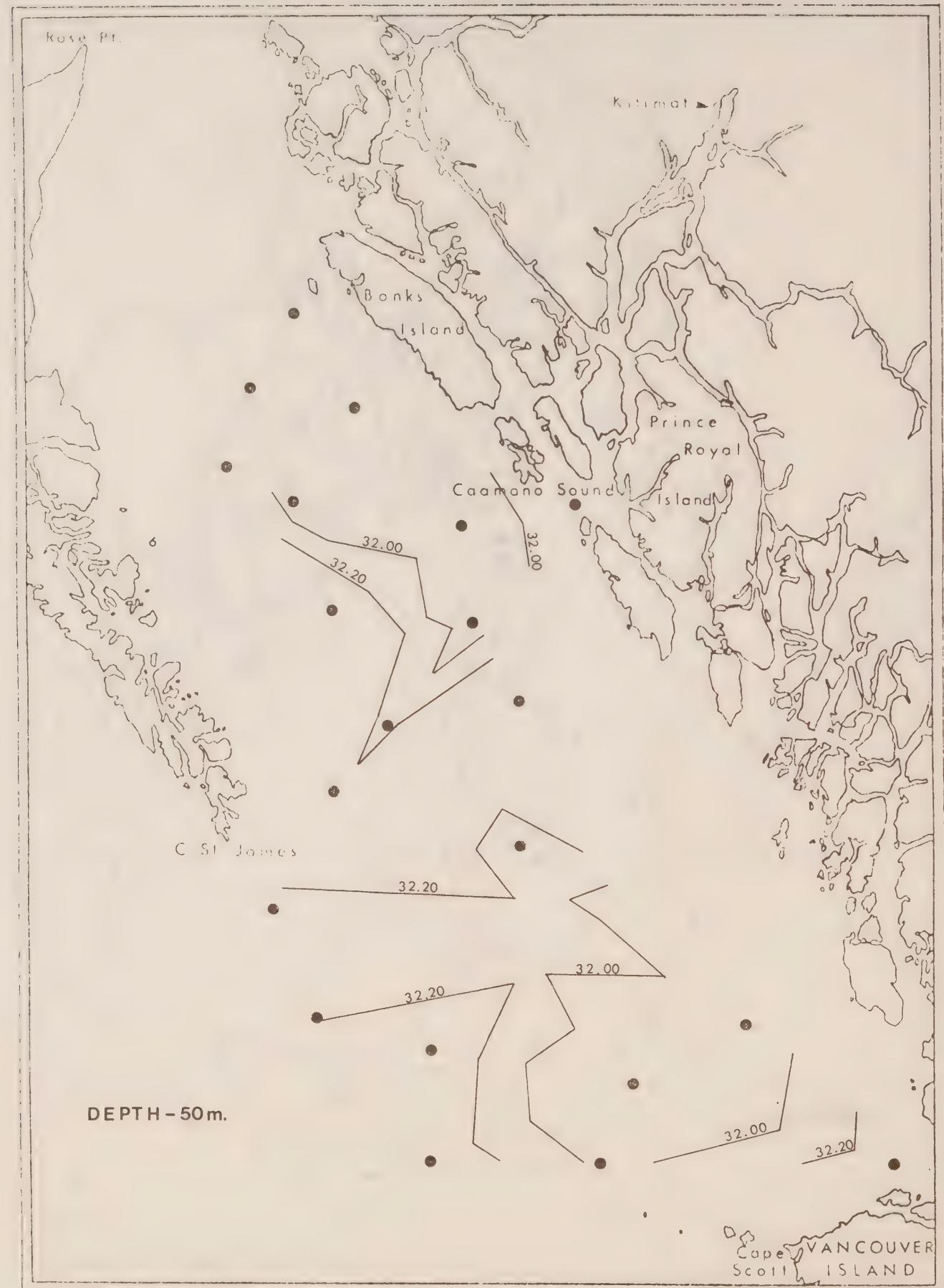
SALINITY
‰

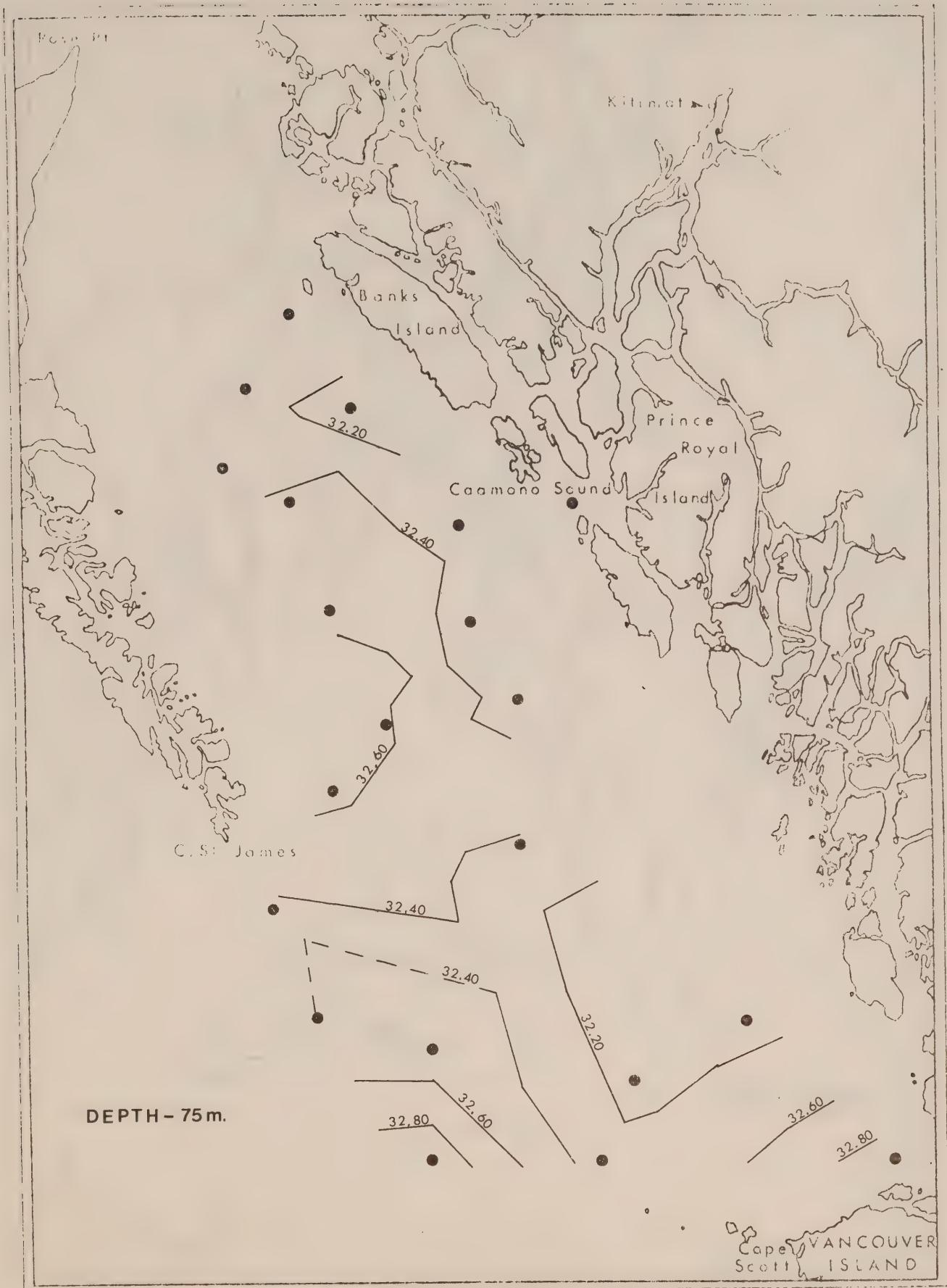


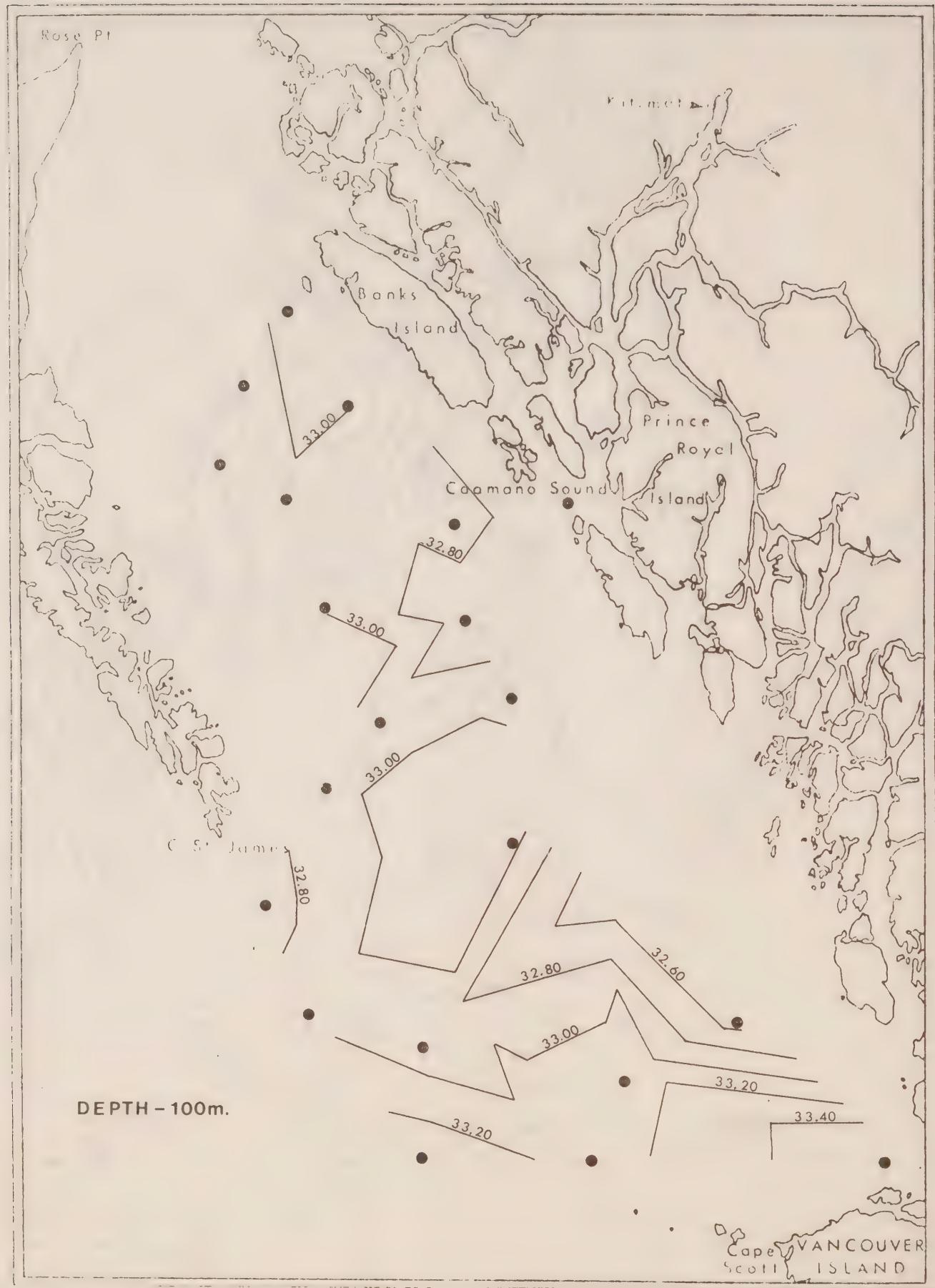


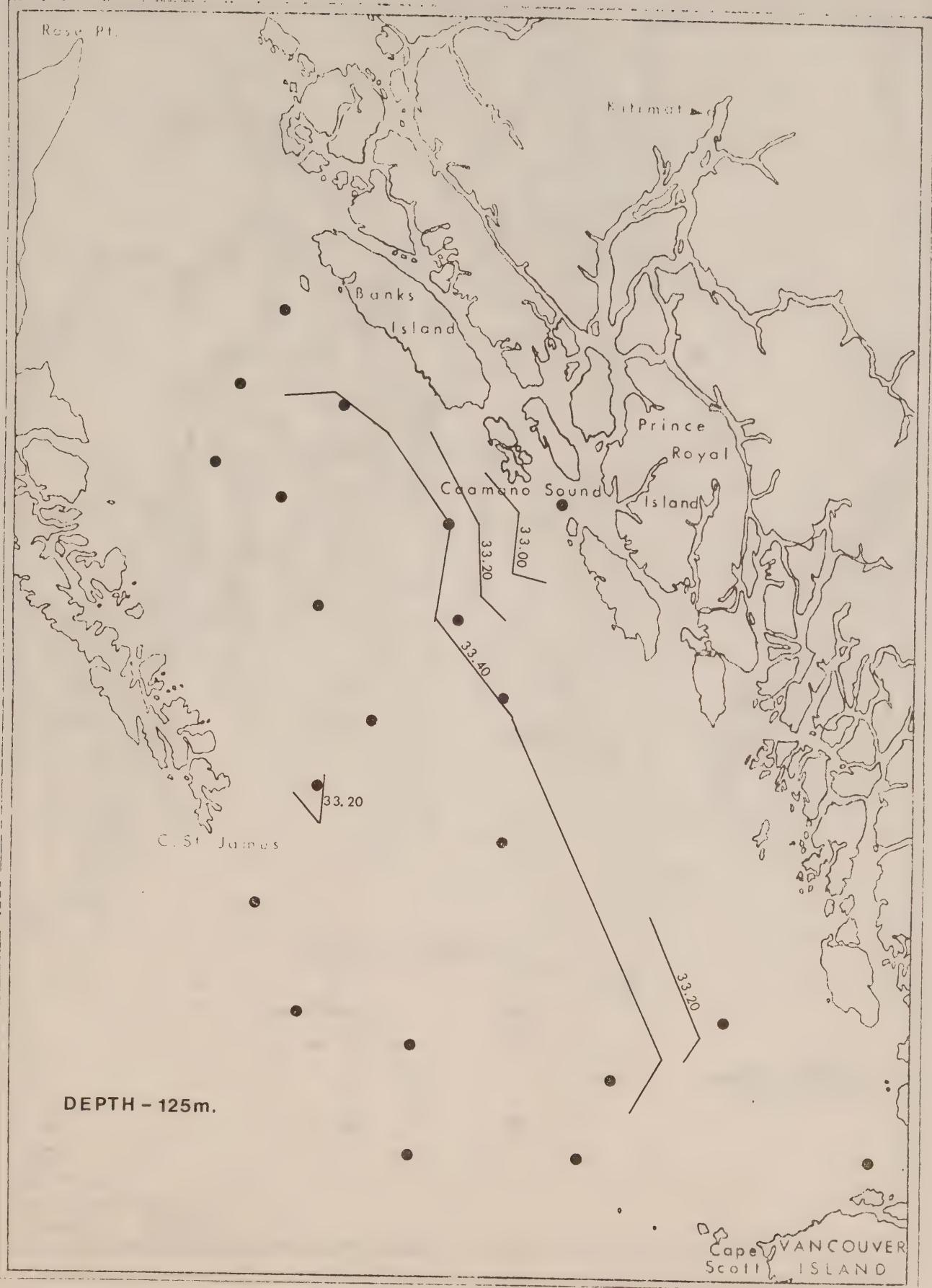


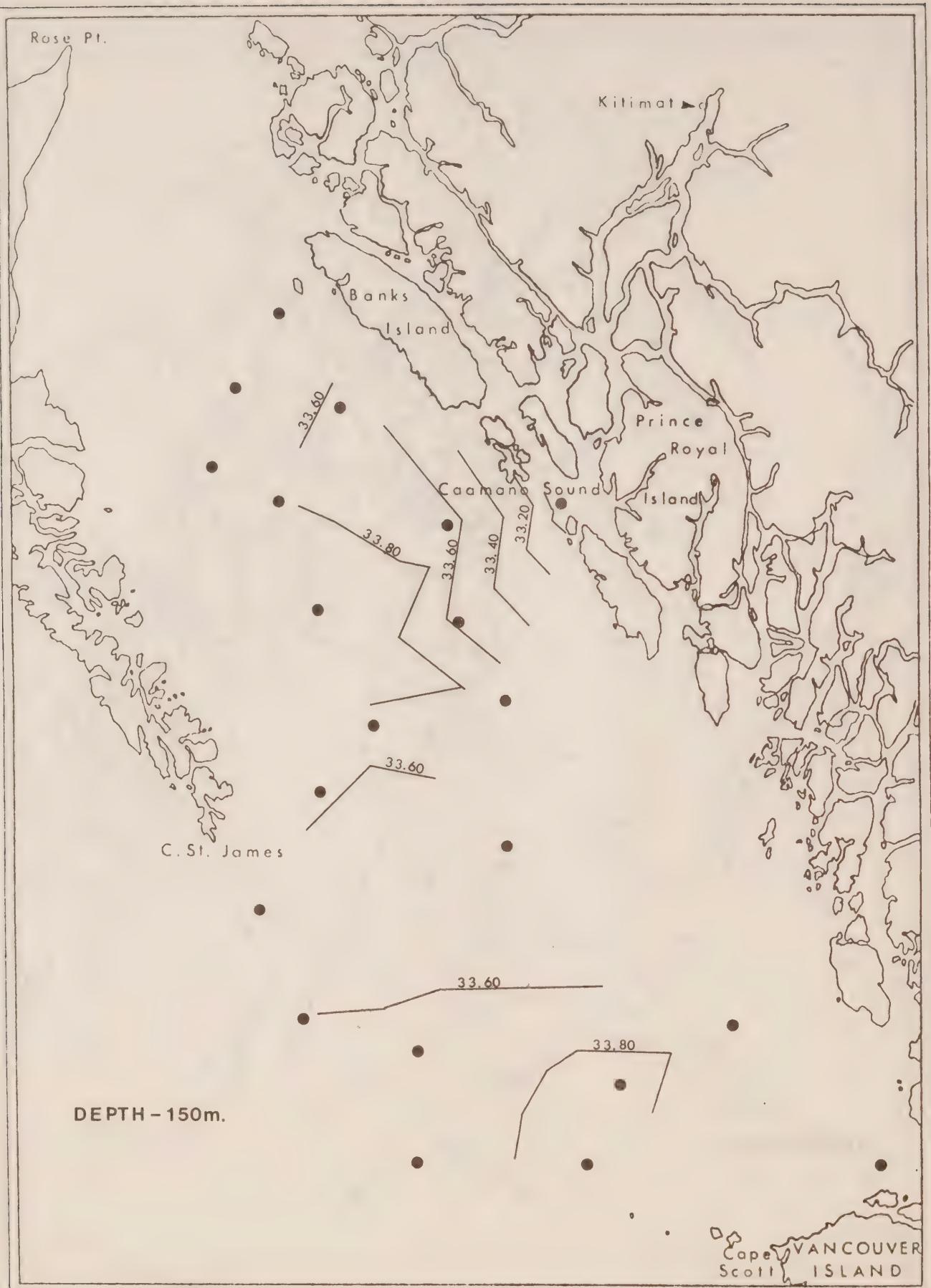


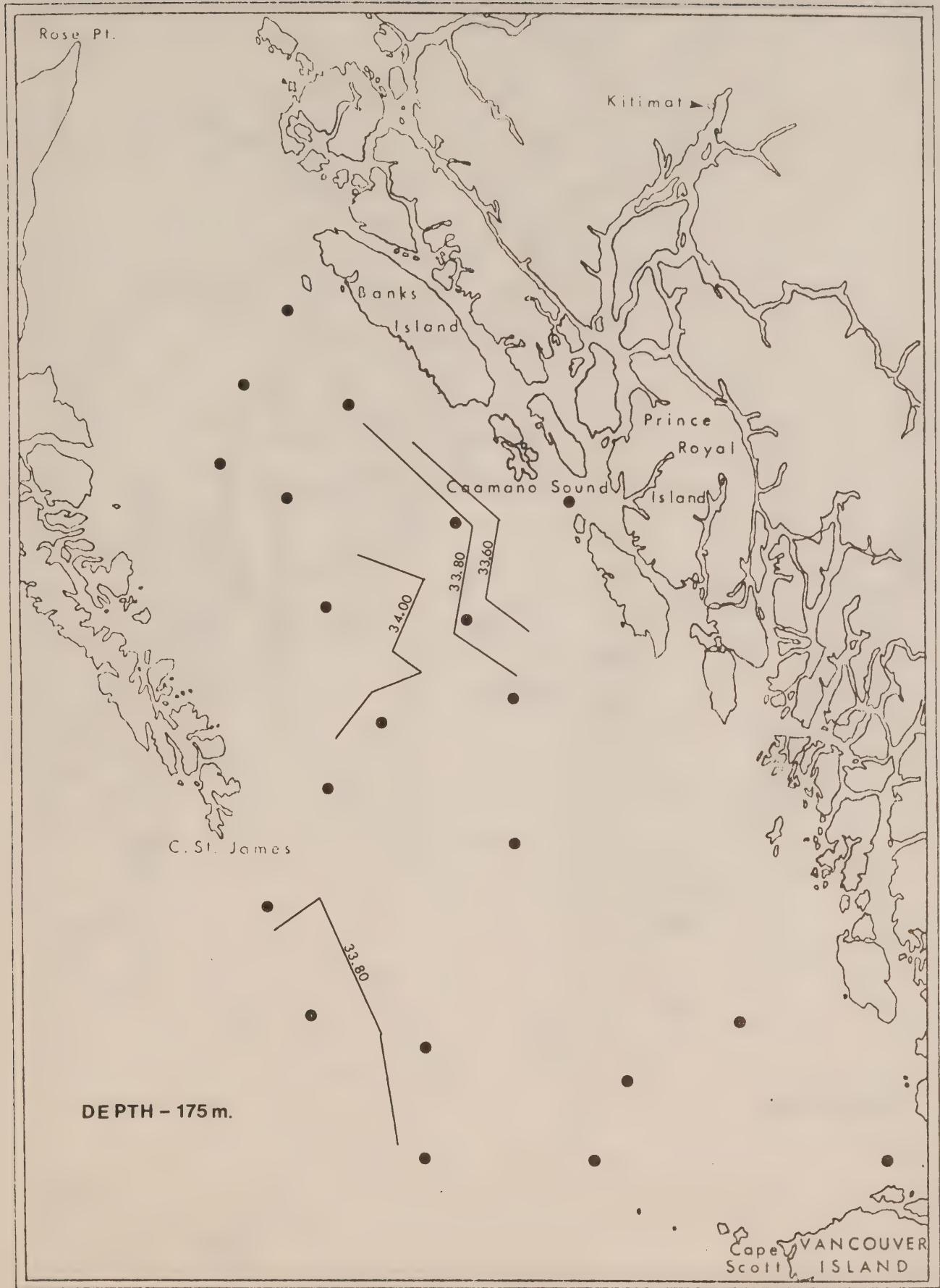


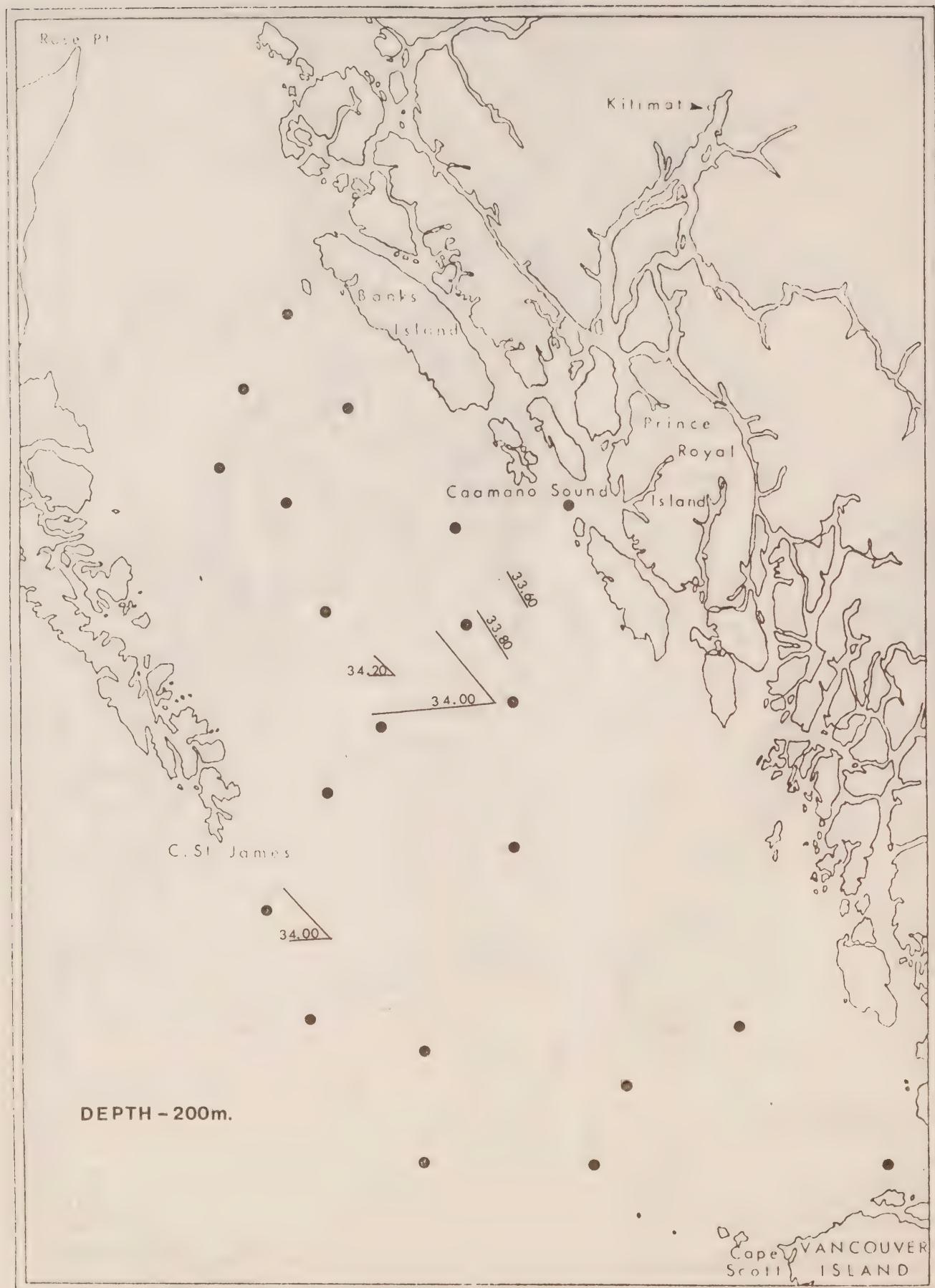


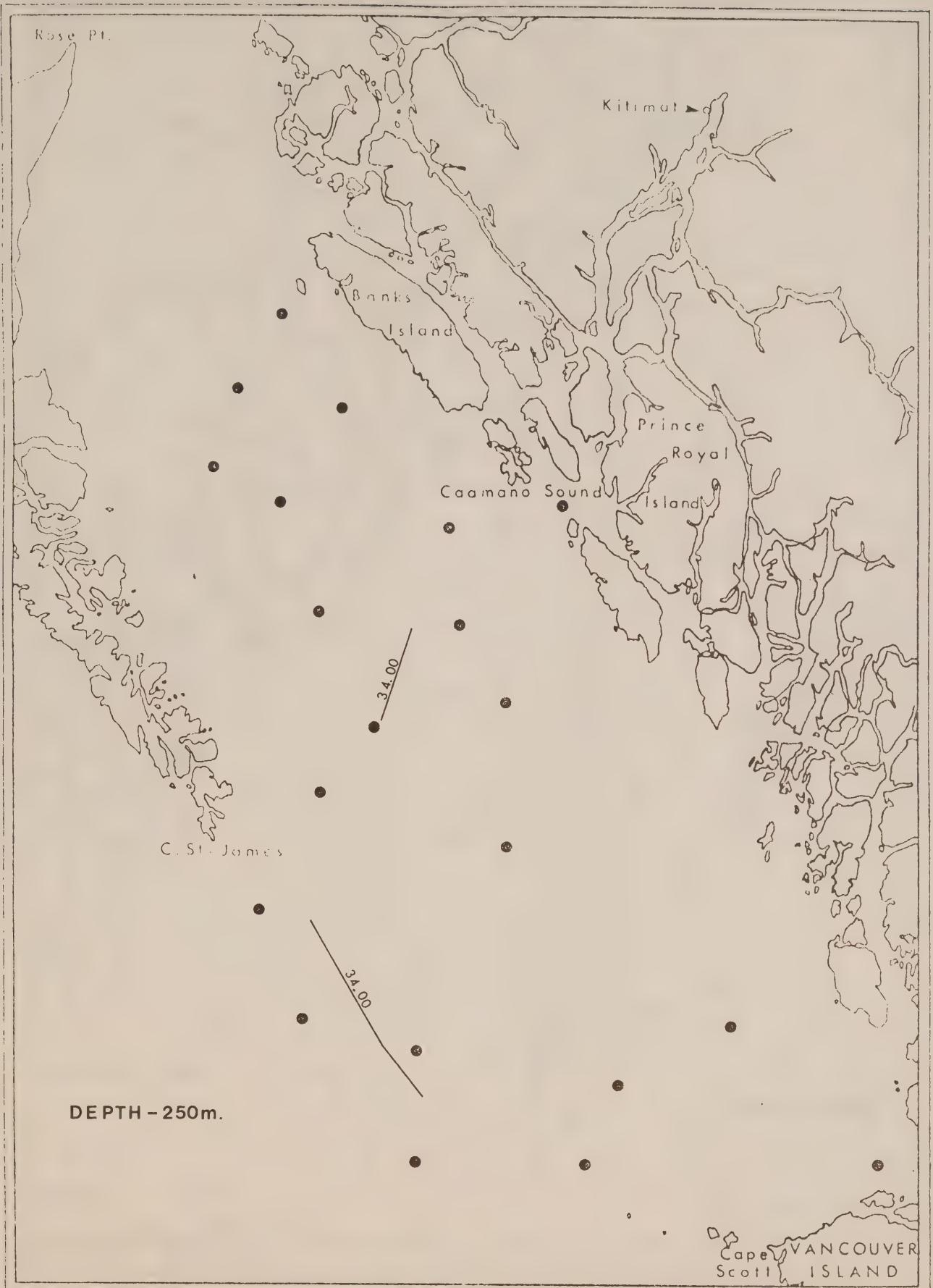




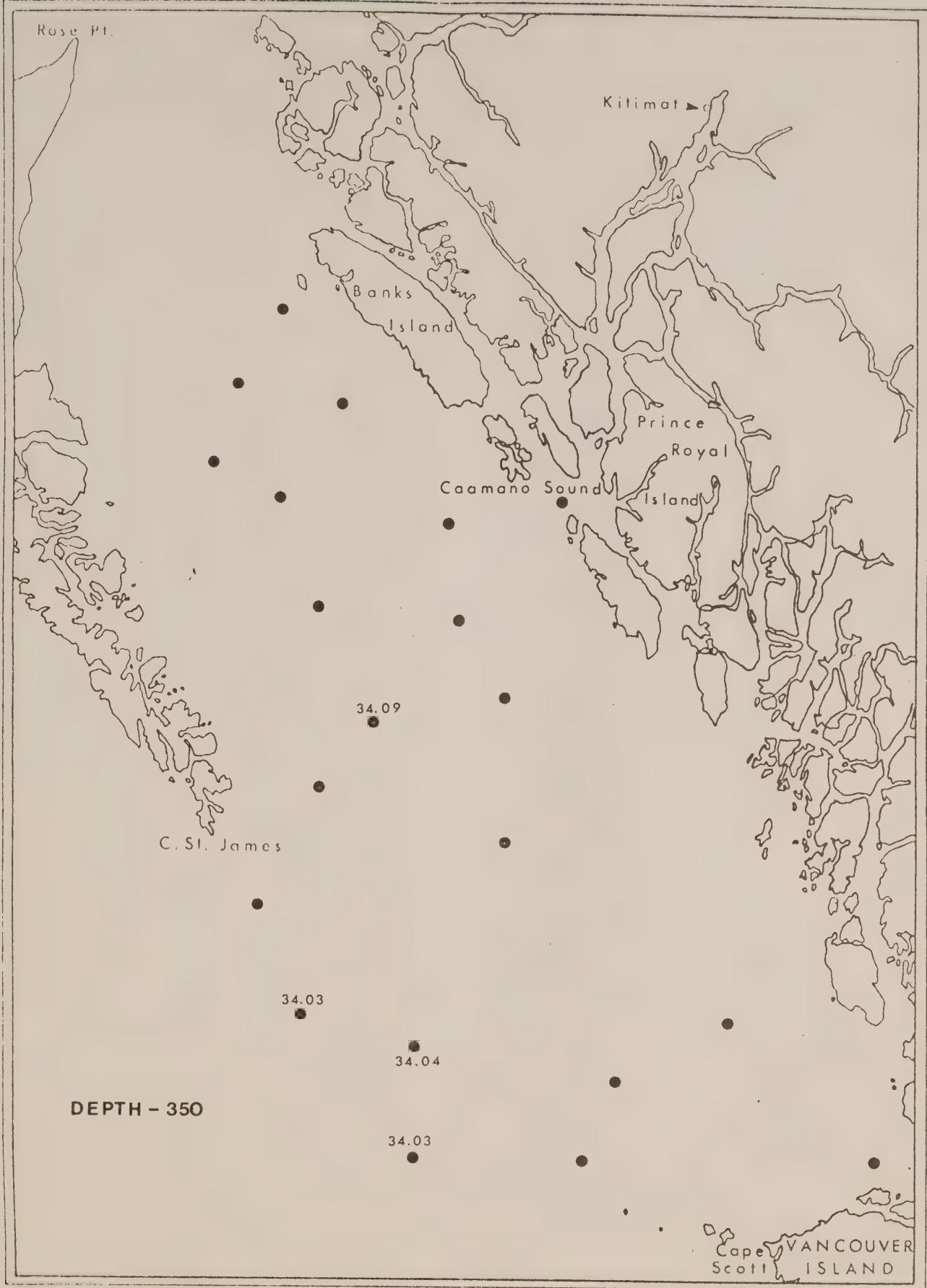




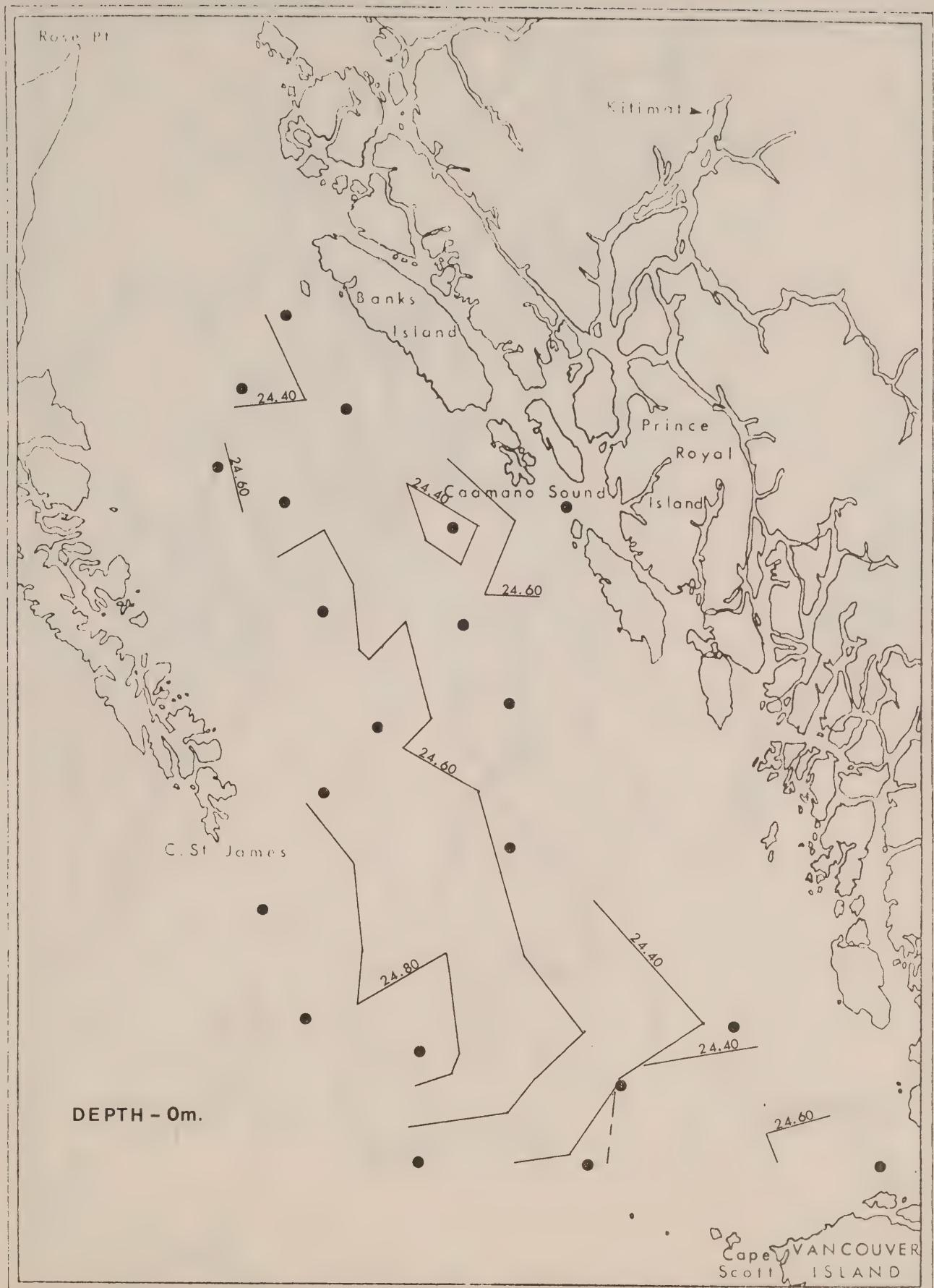




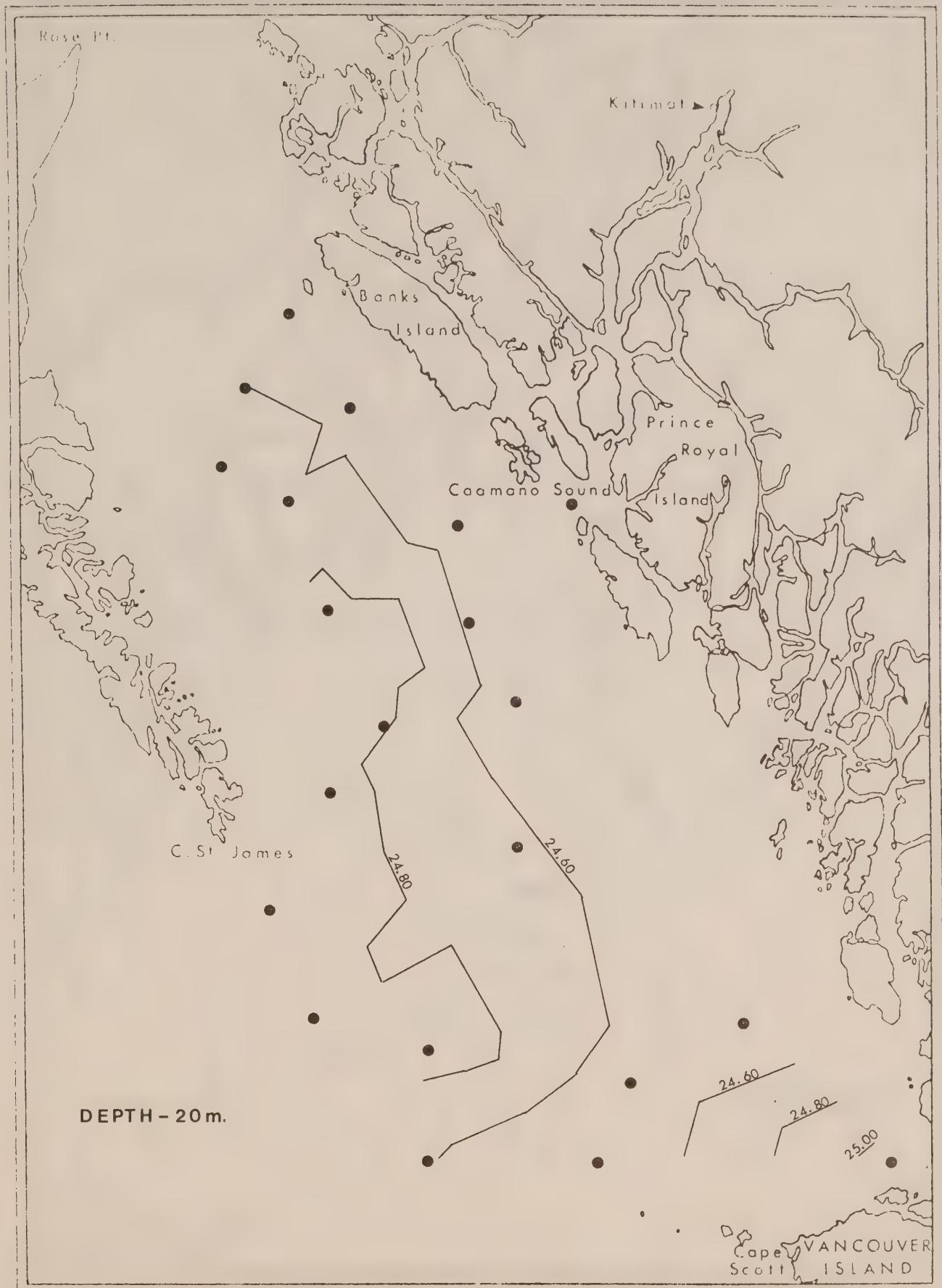




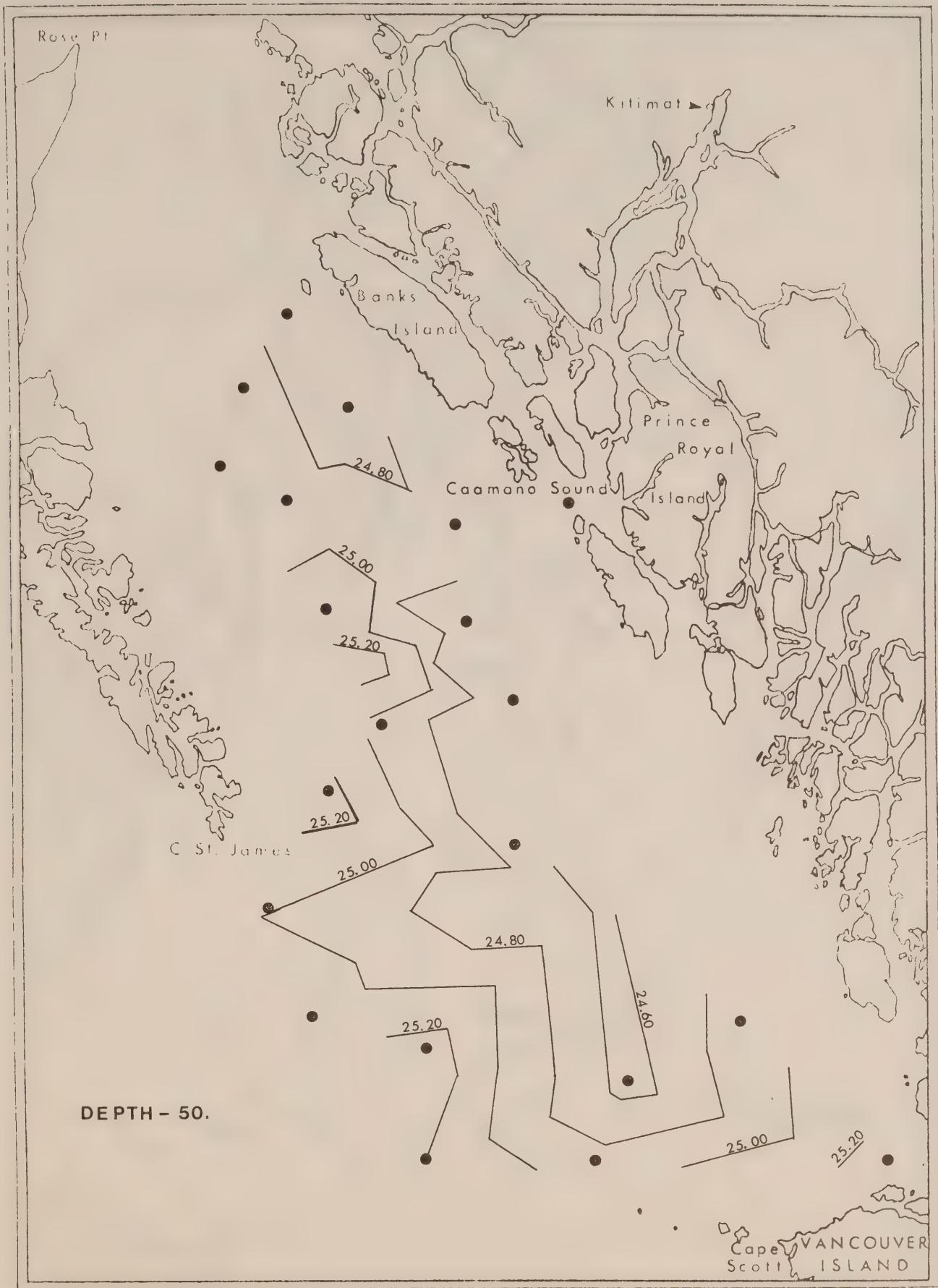
SIGMA-t



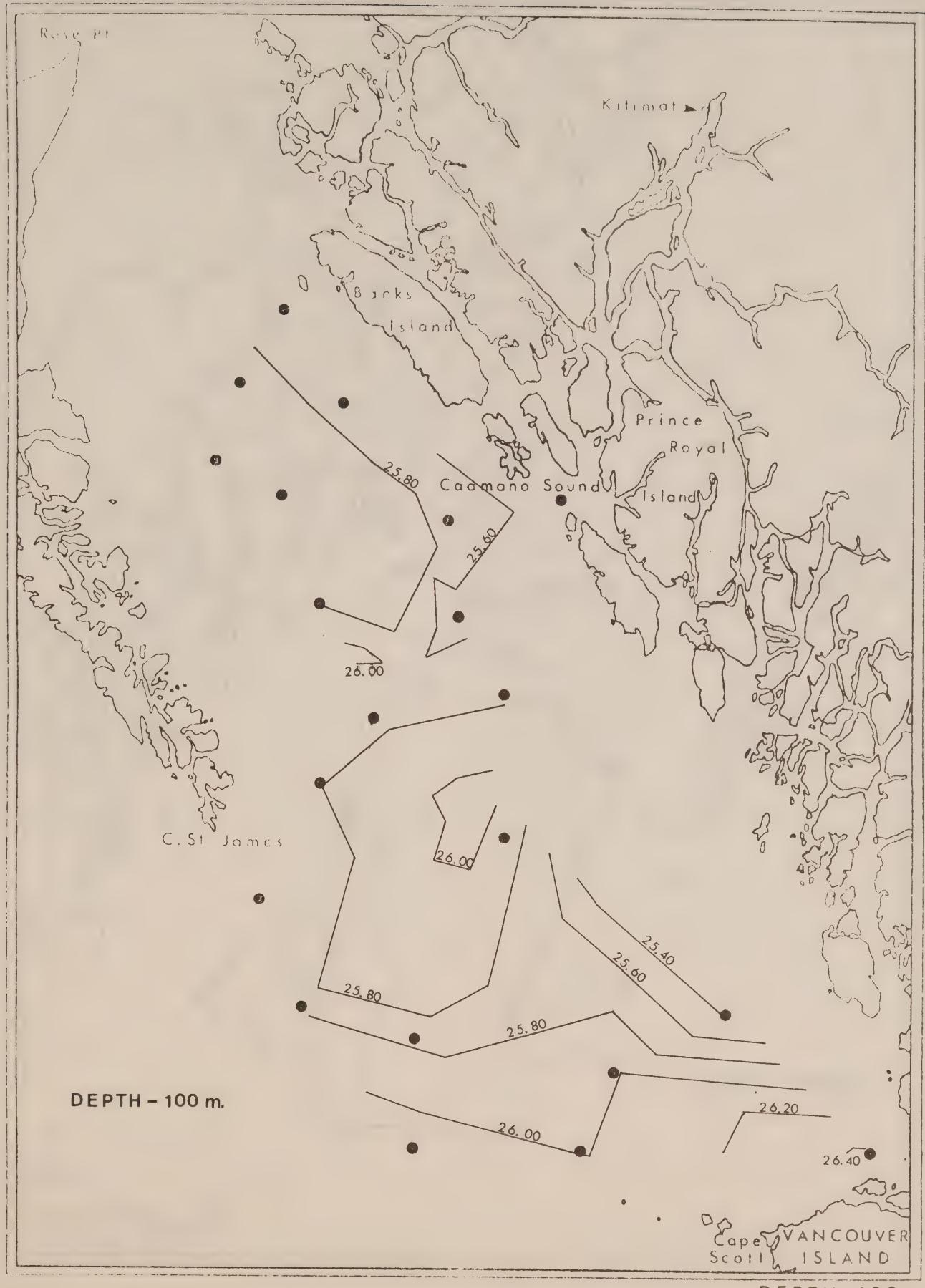


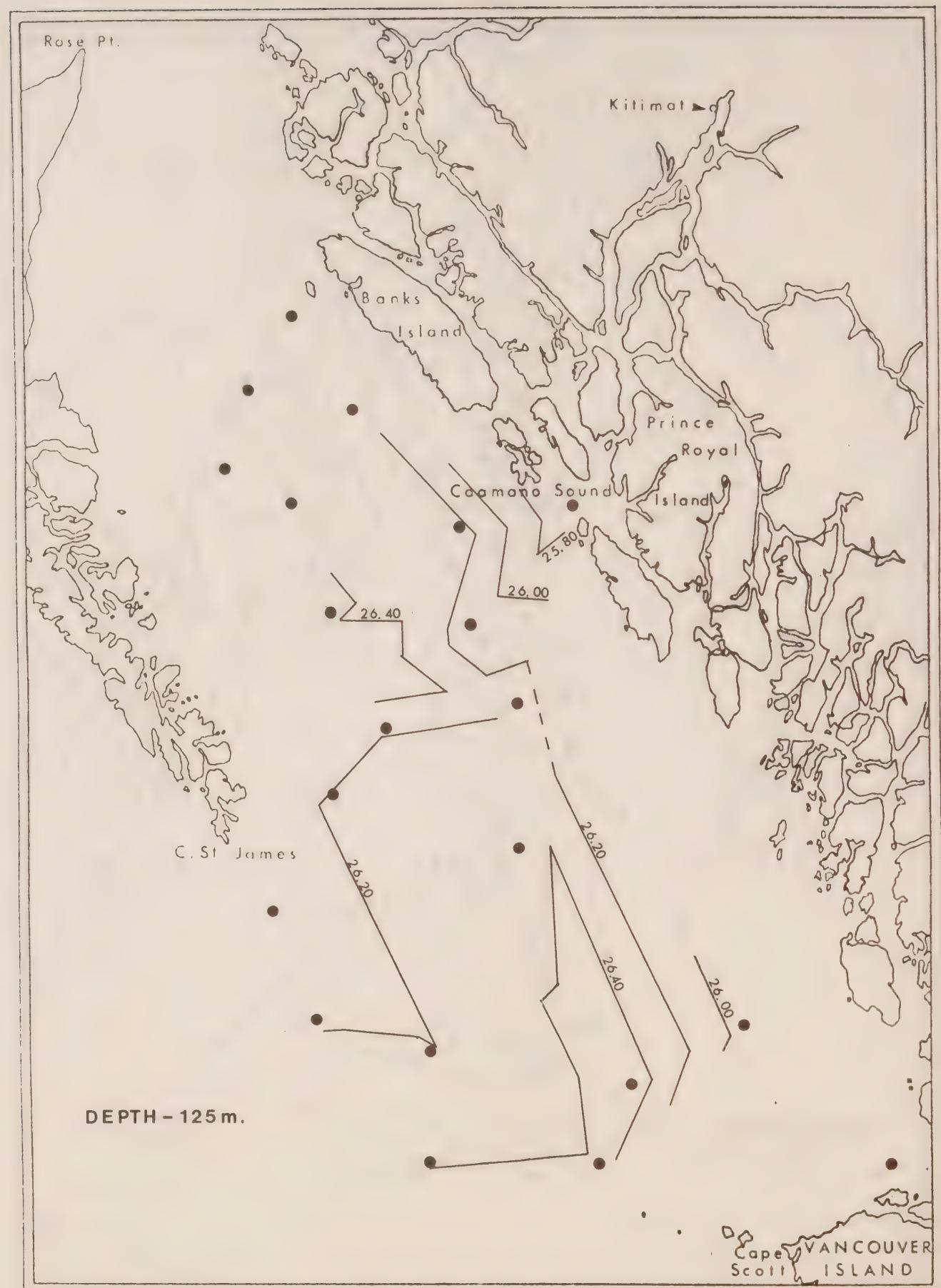




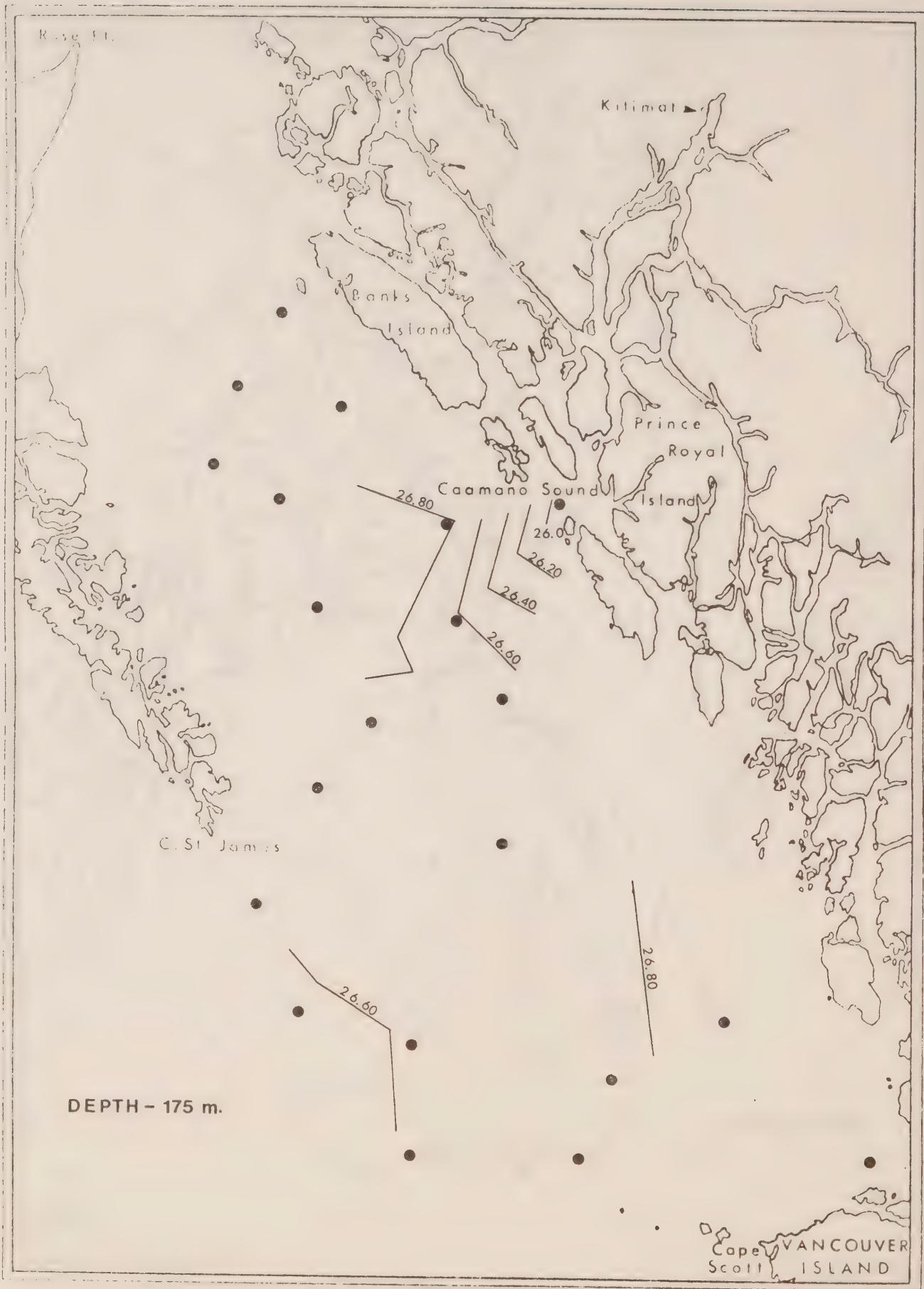


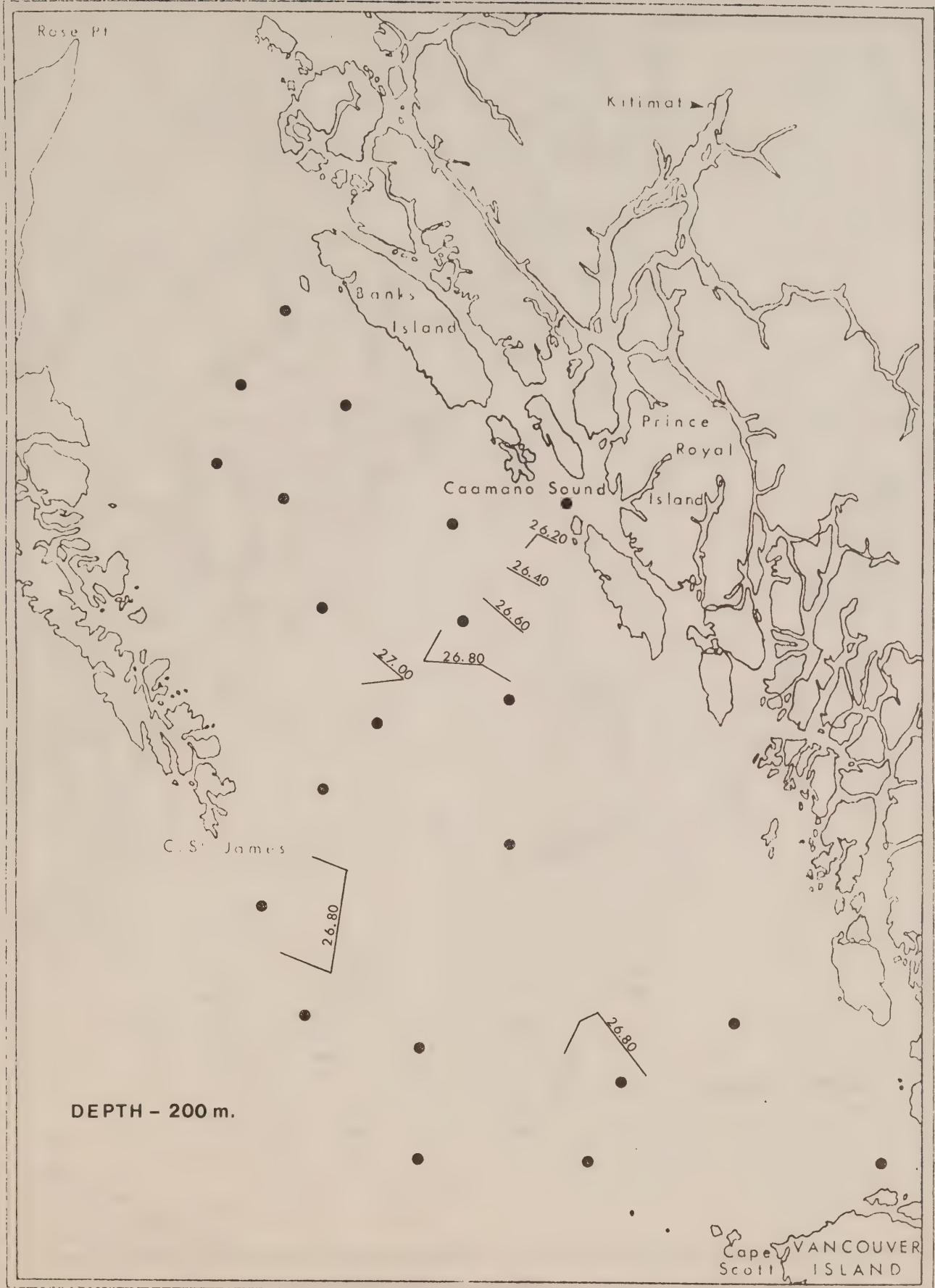


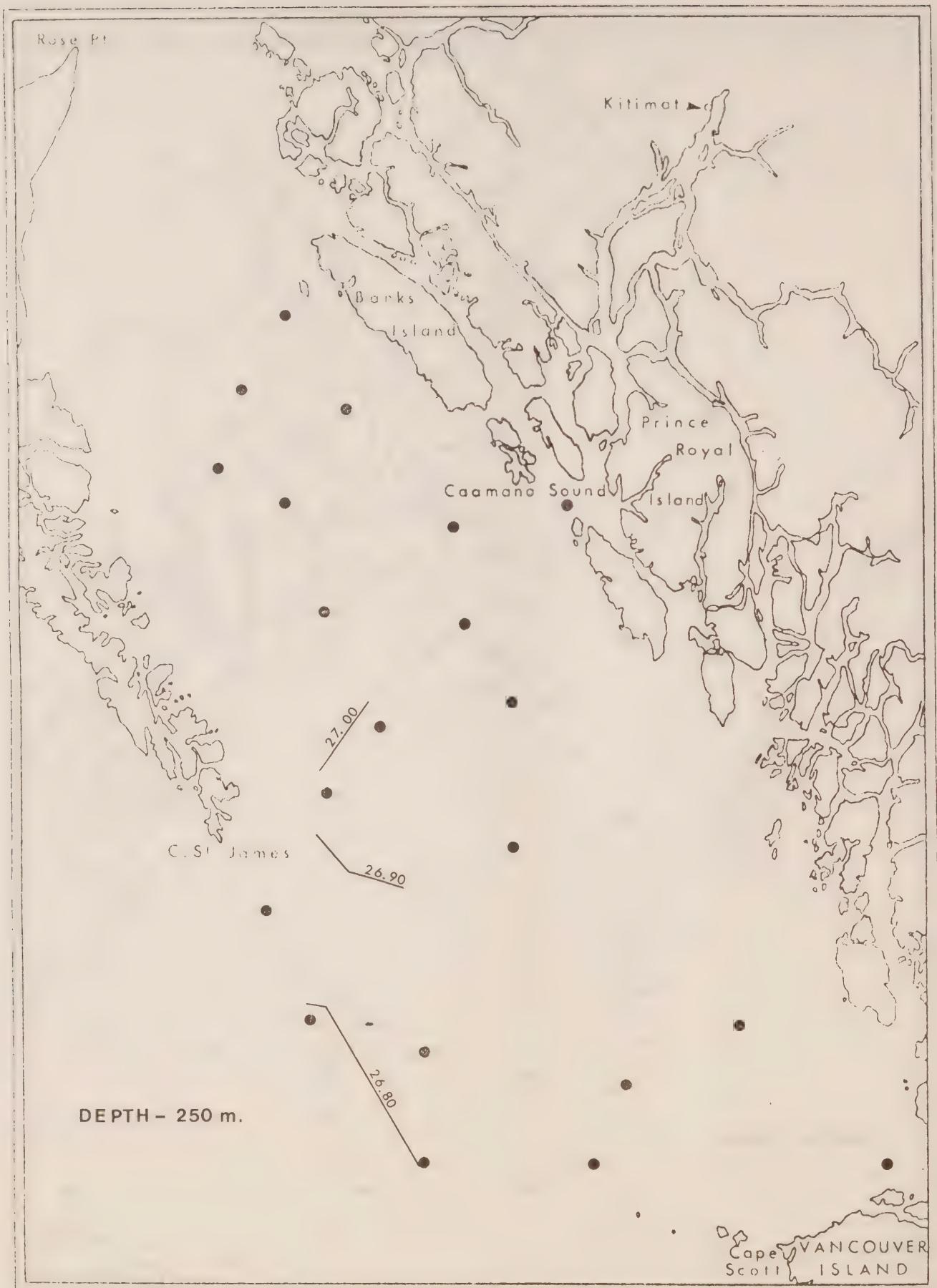


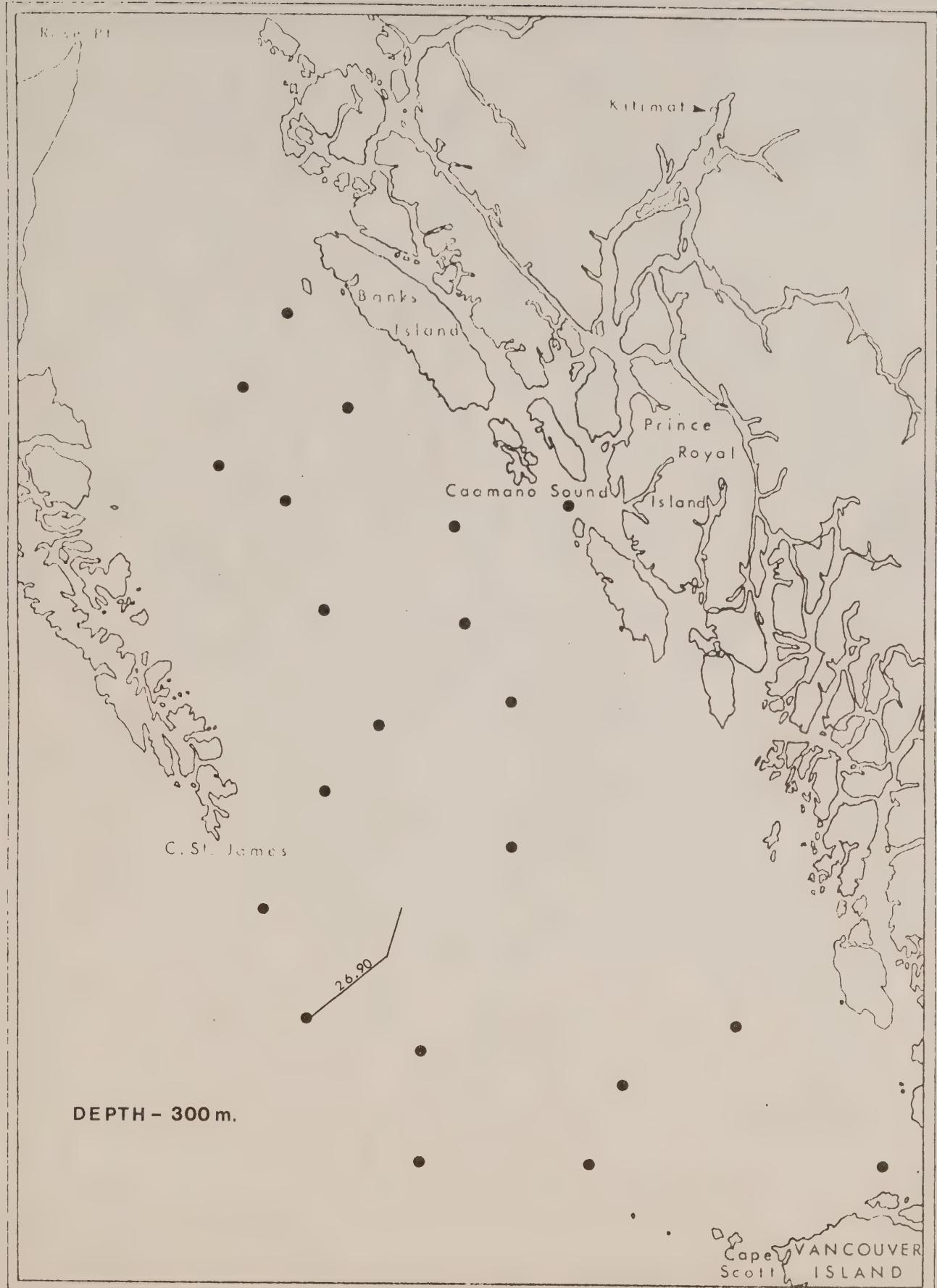


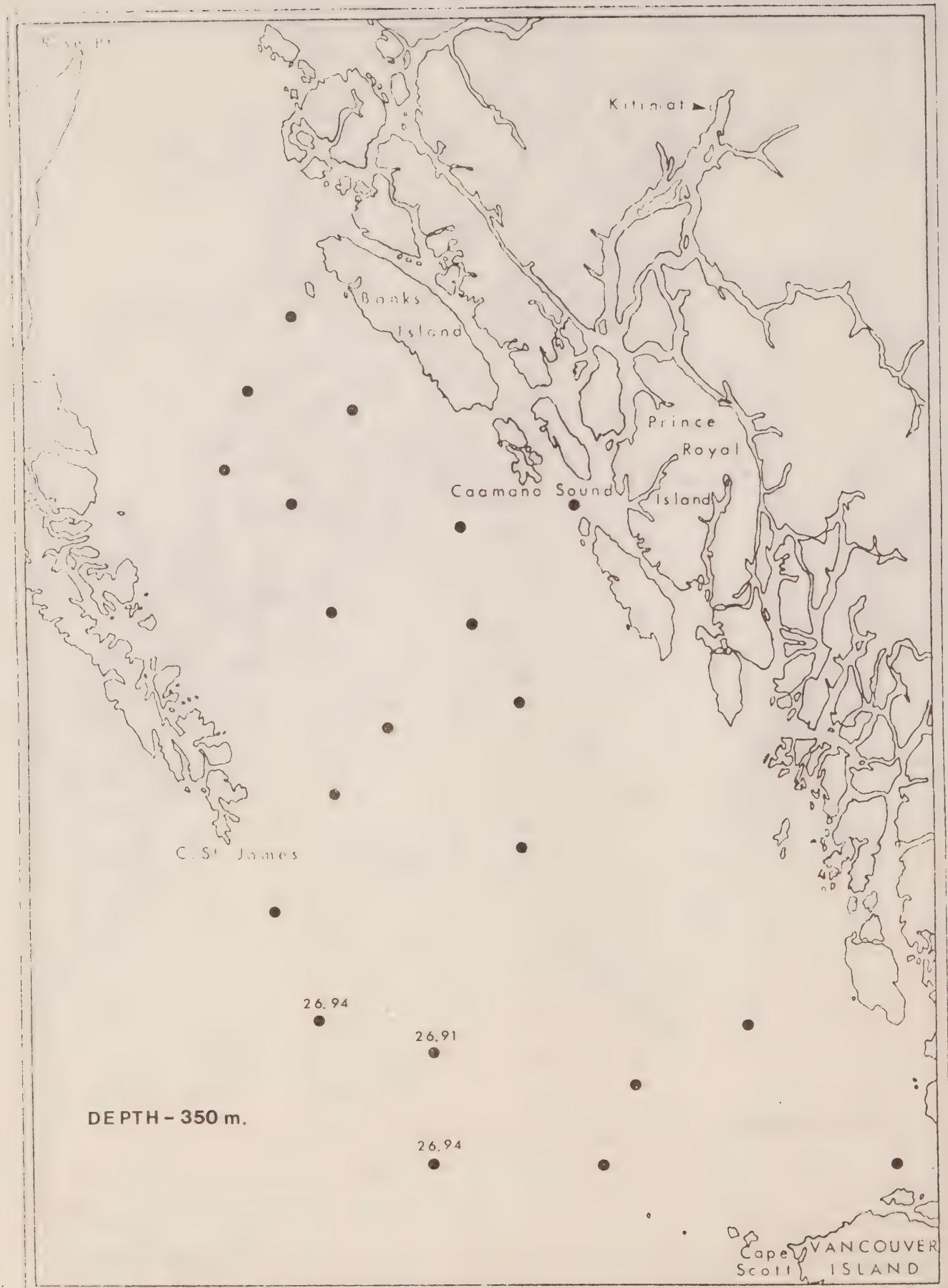




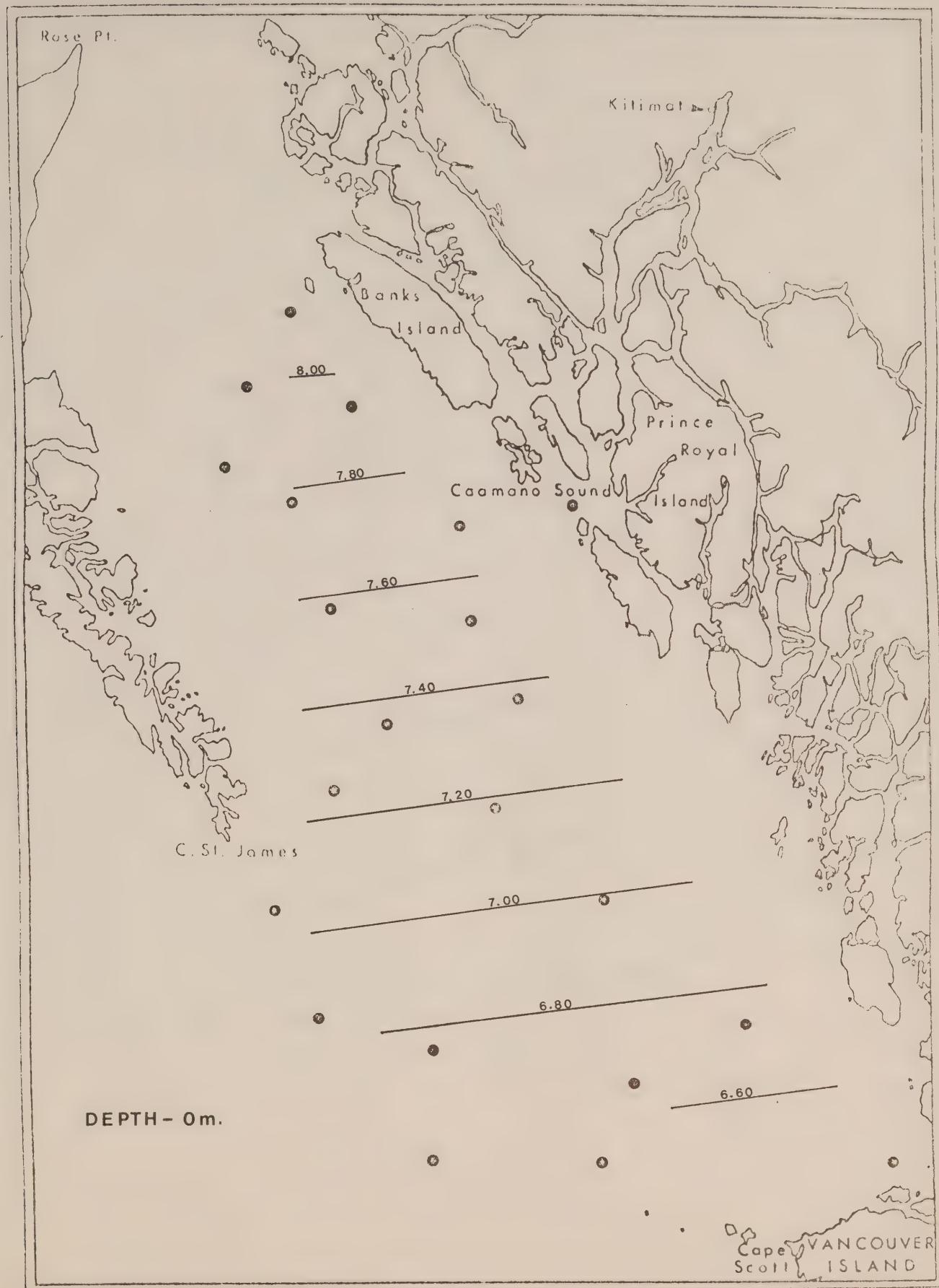


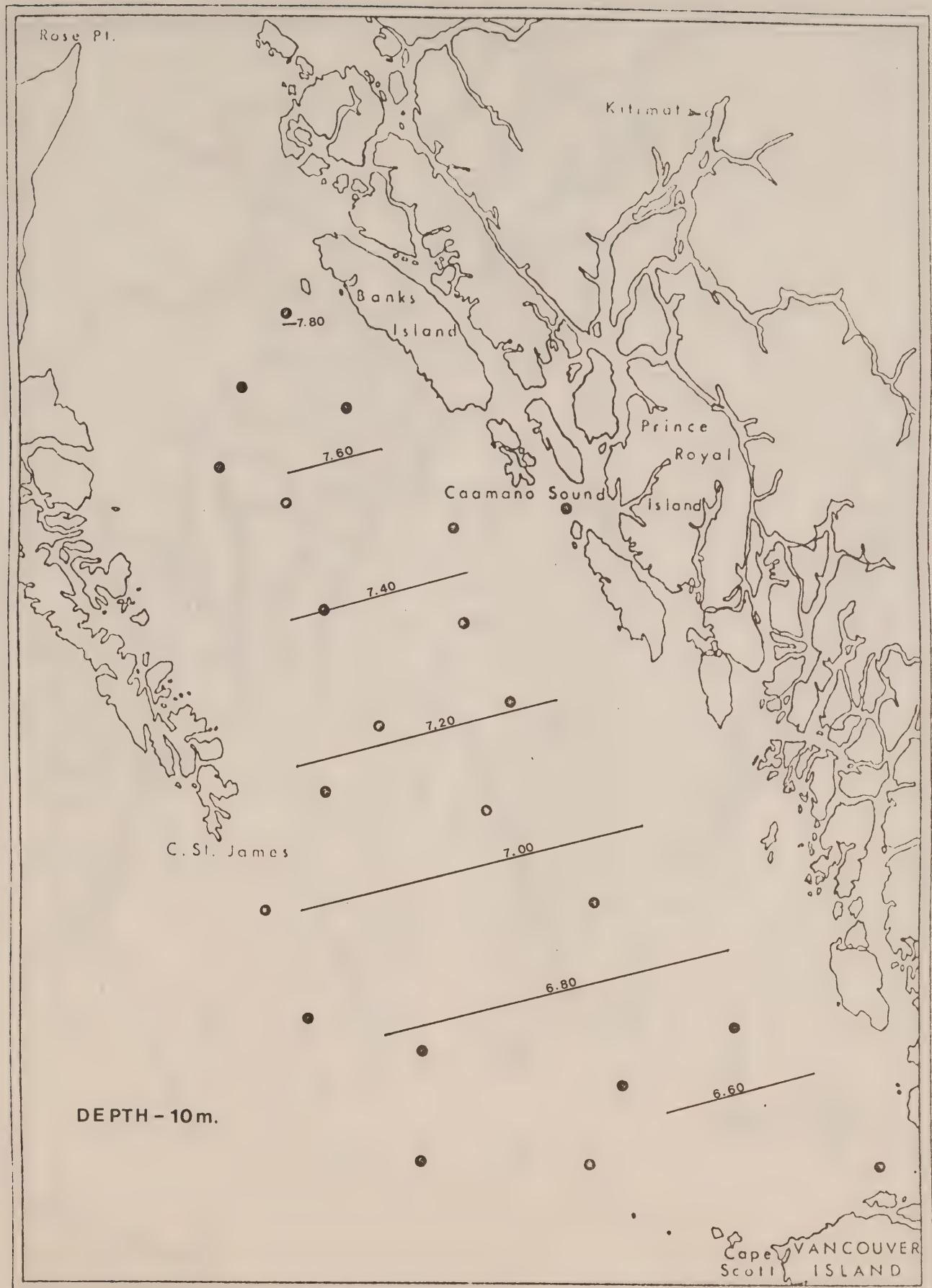


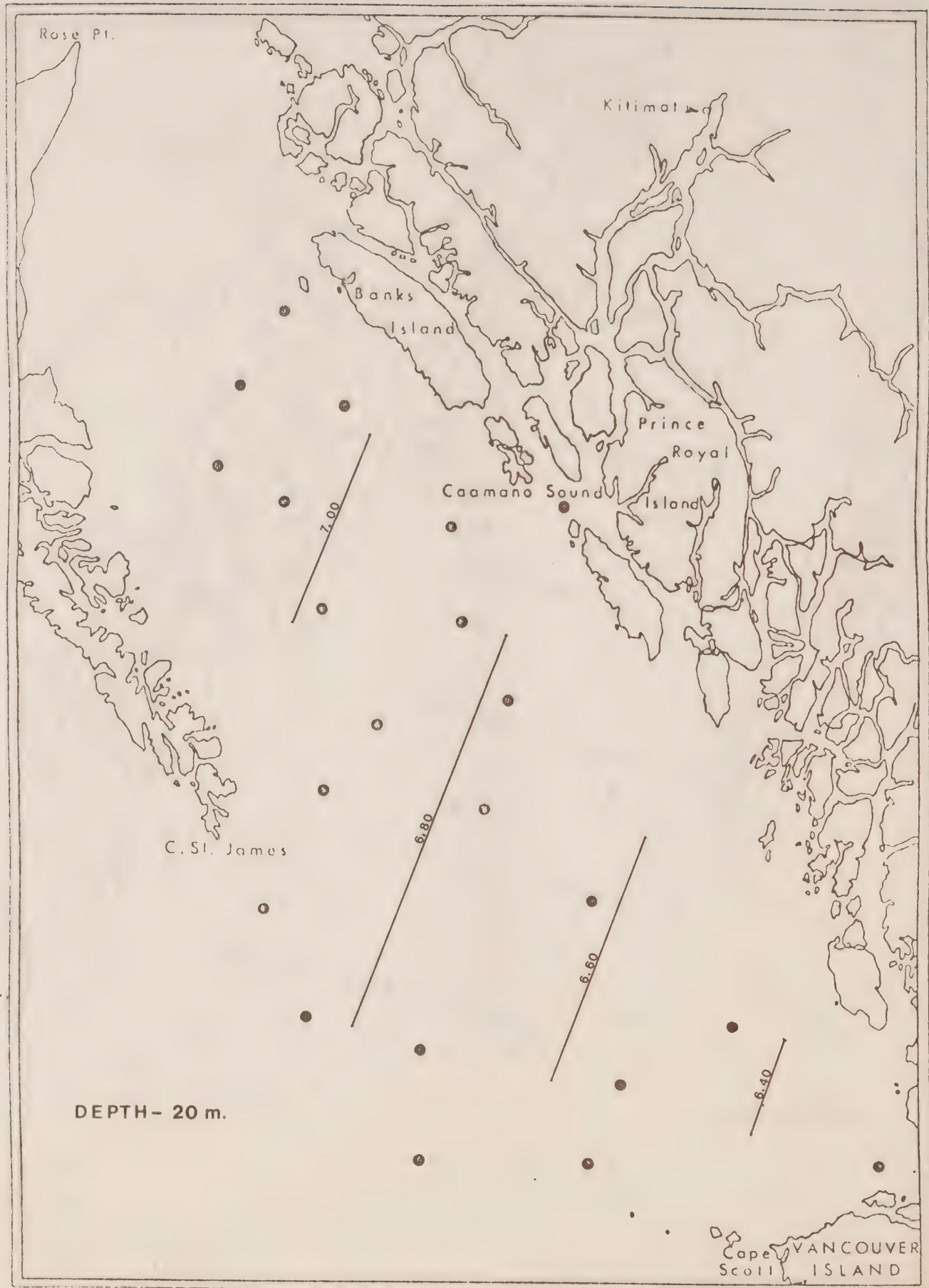


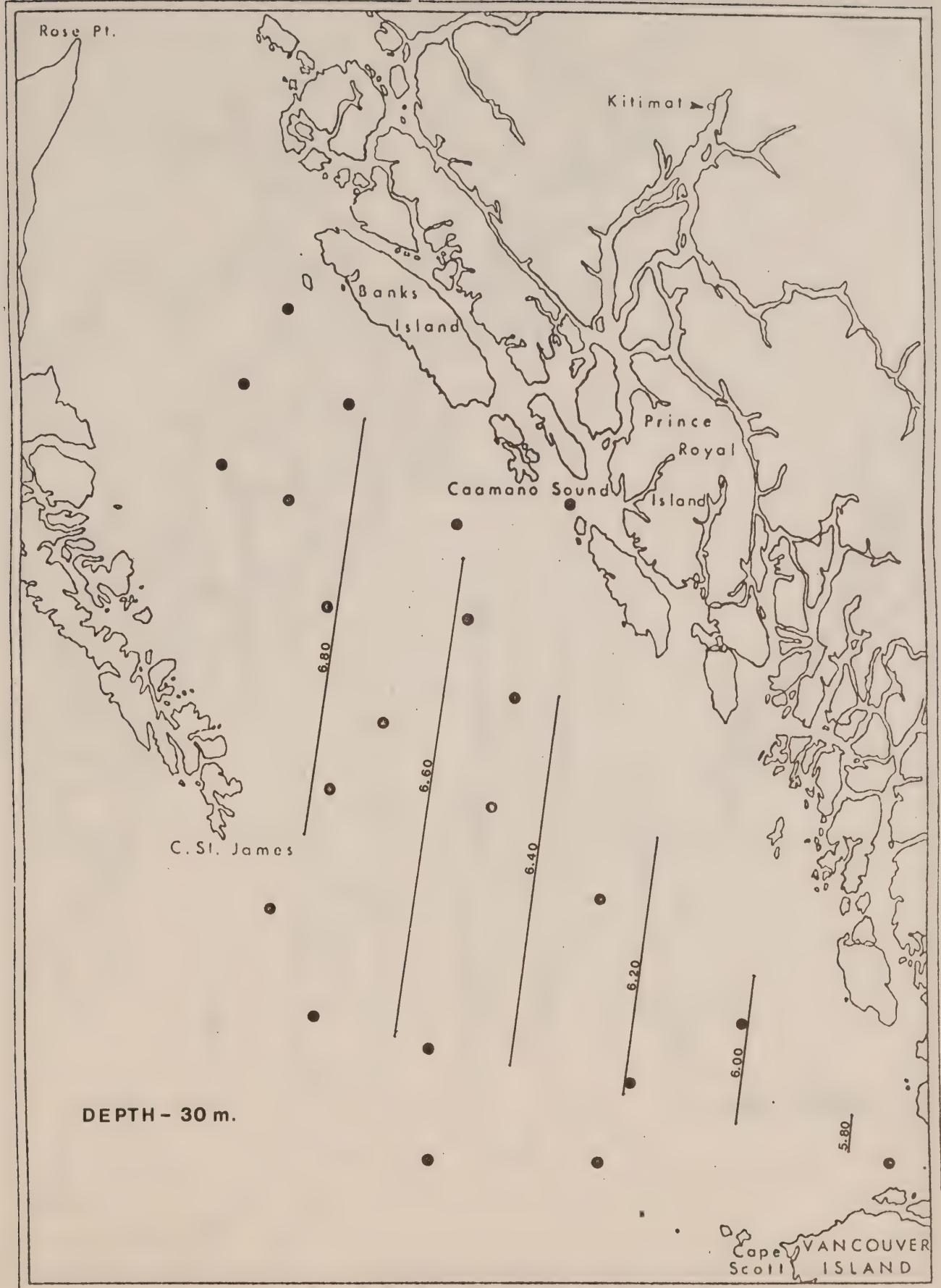


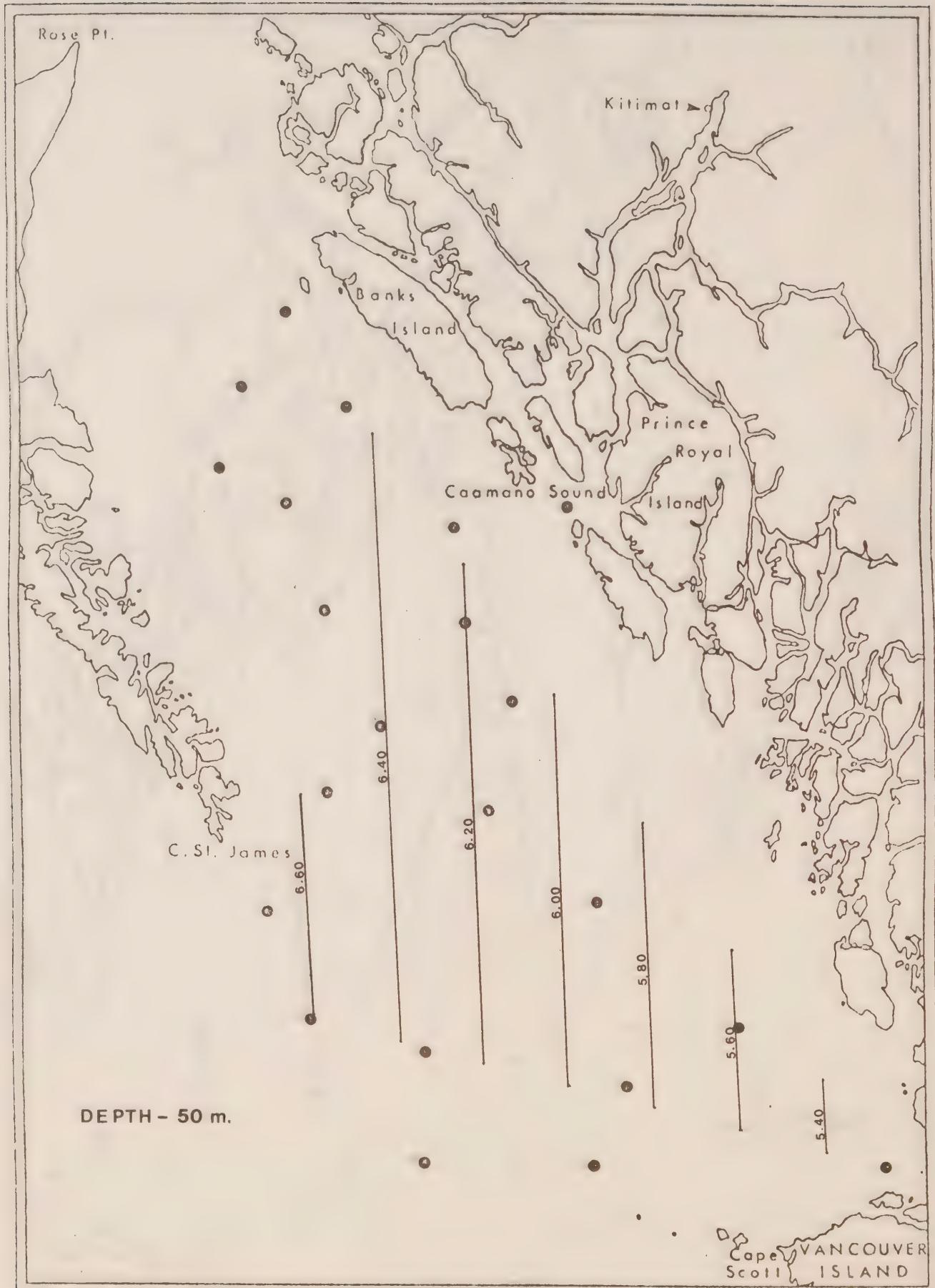
DISSOLVED OXYGEN
(mL/L)

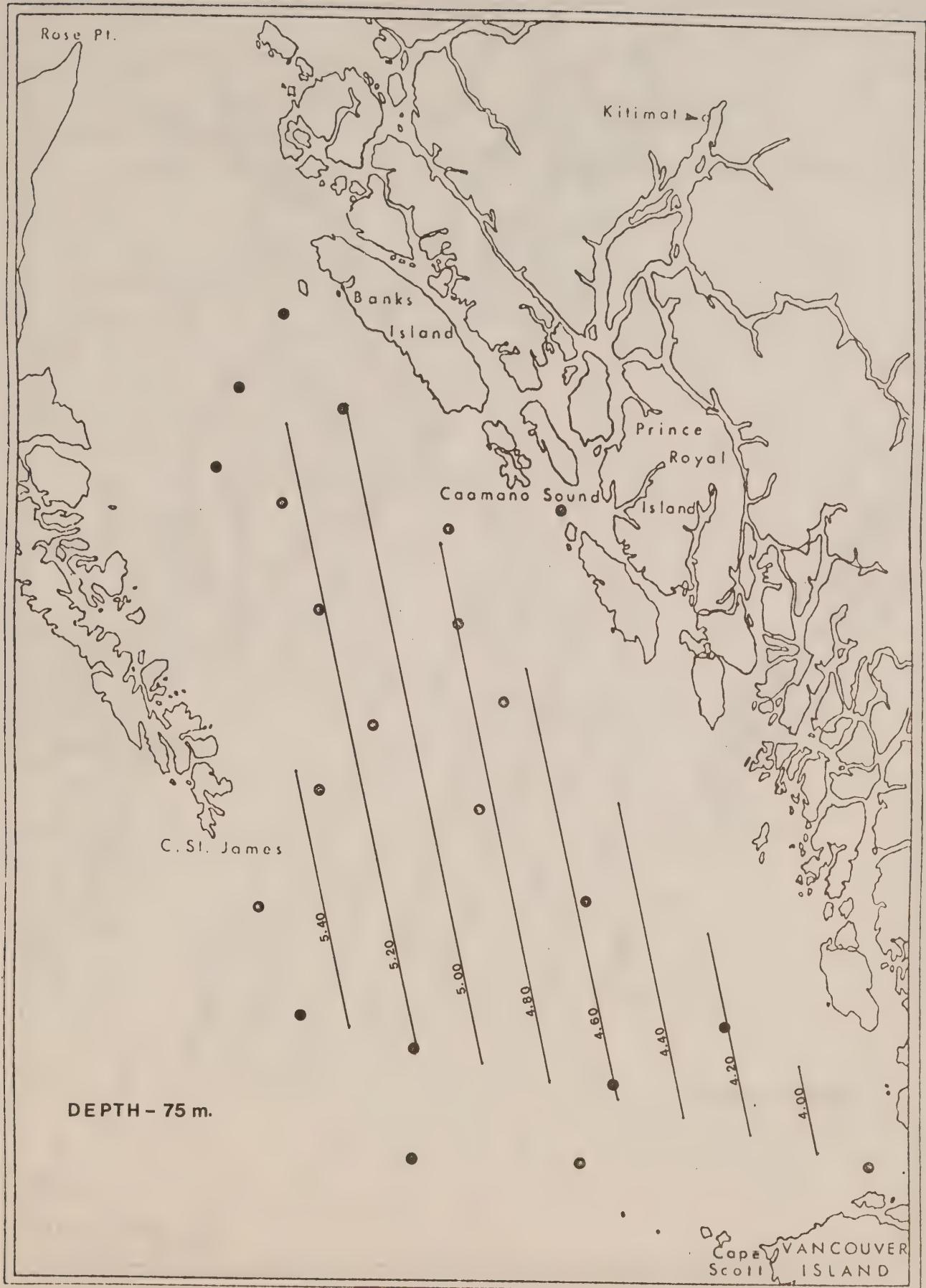


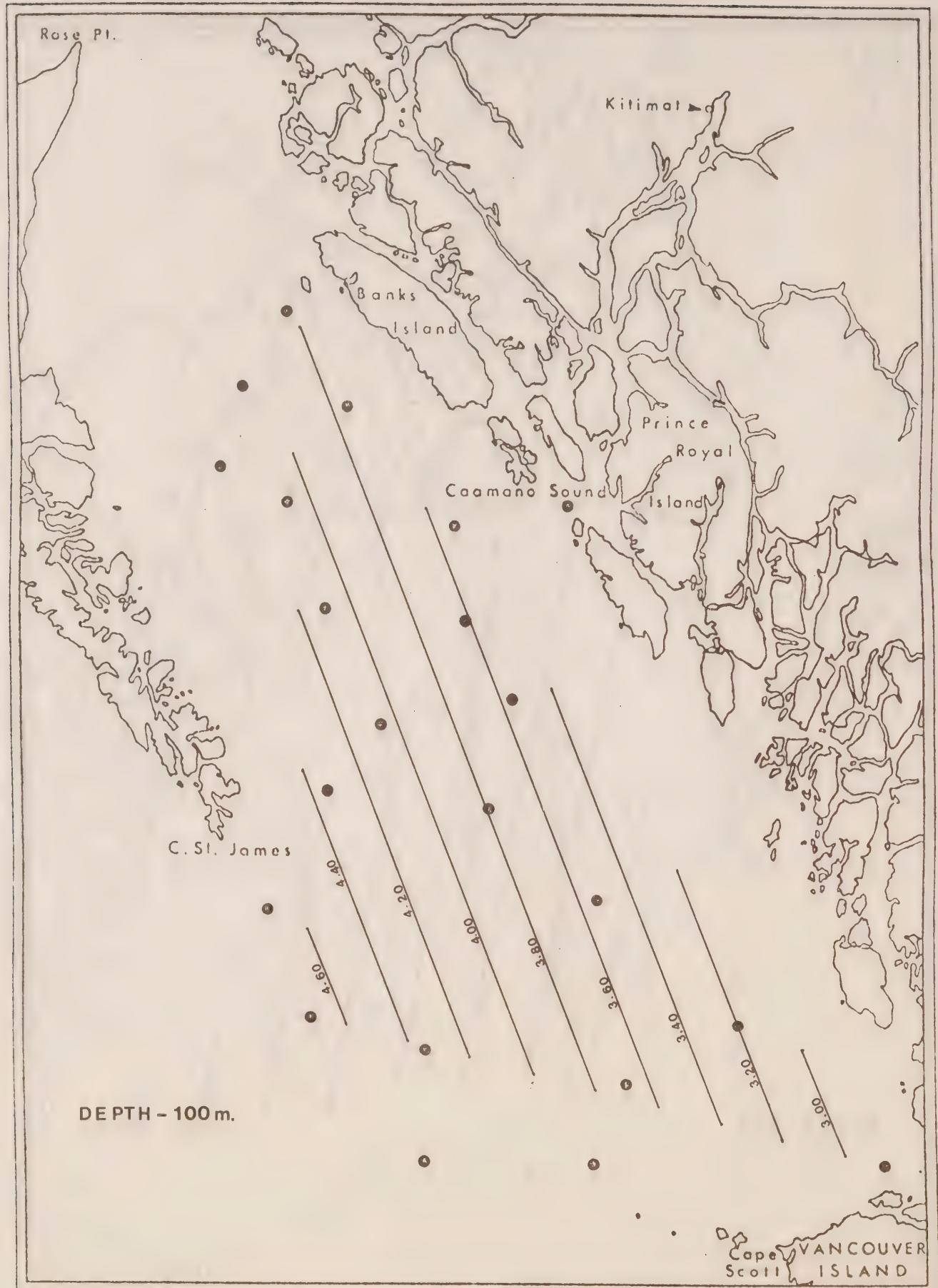










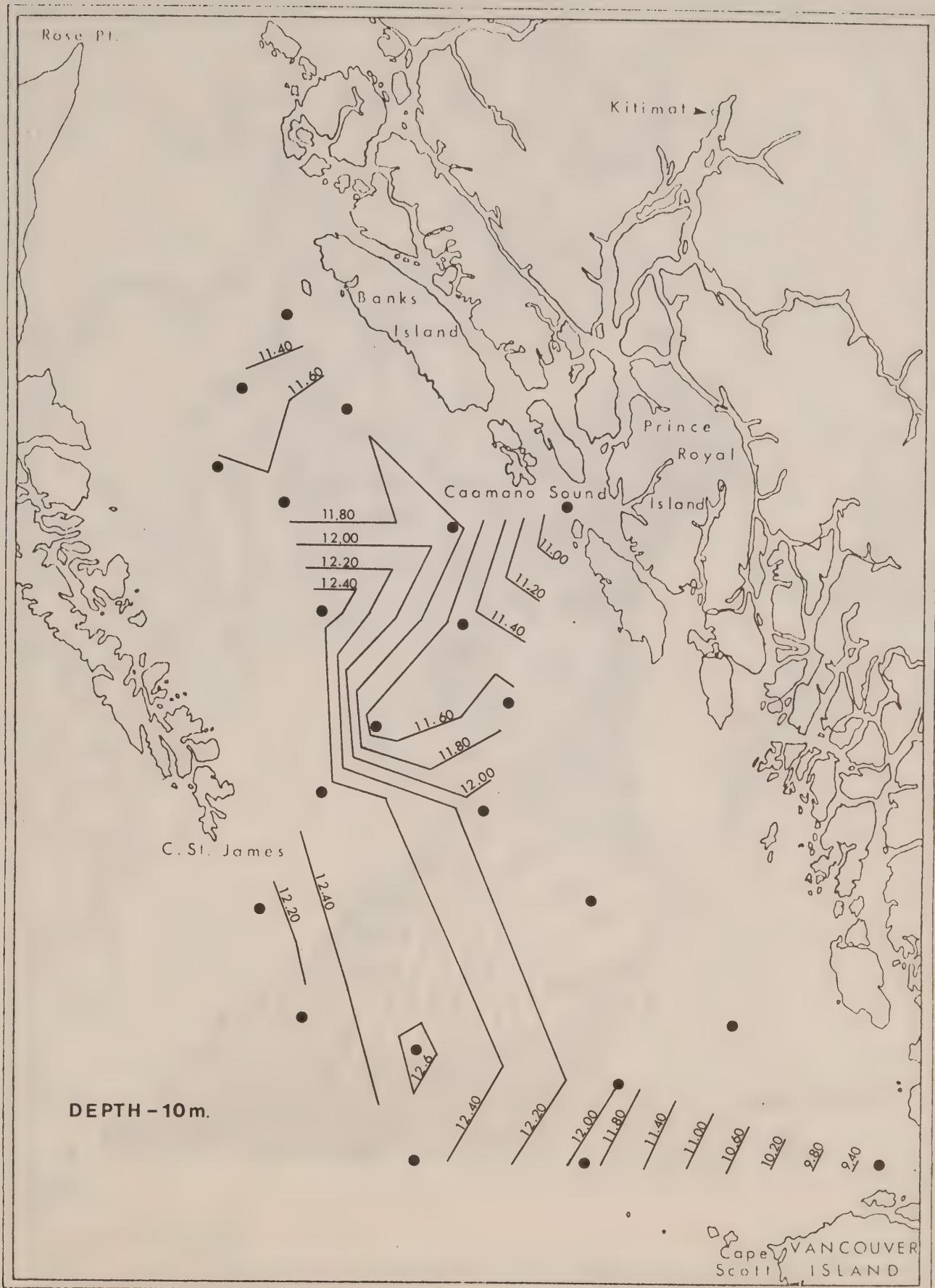


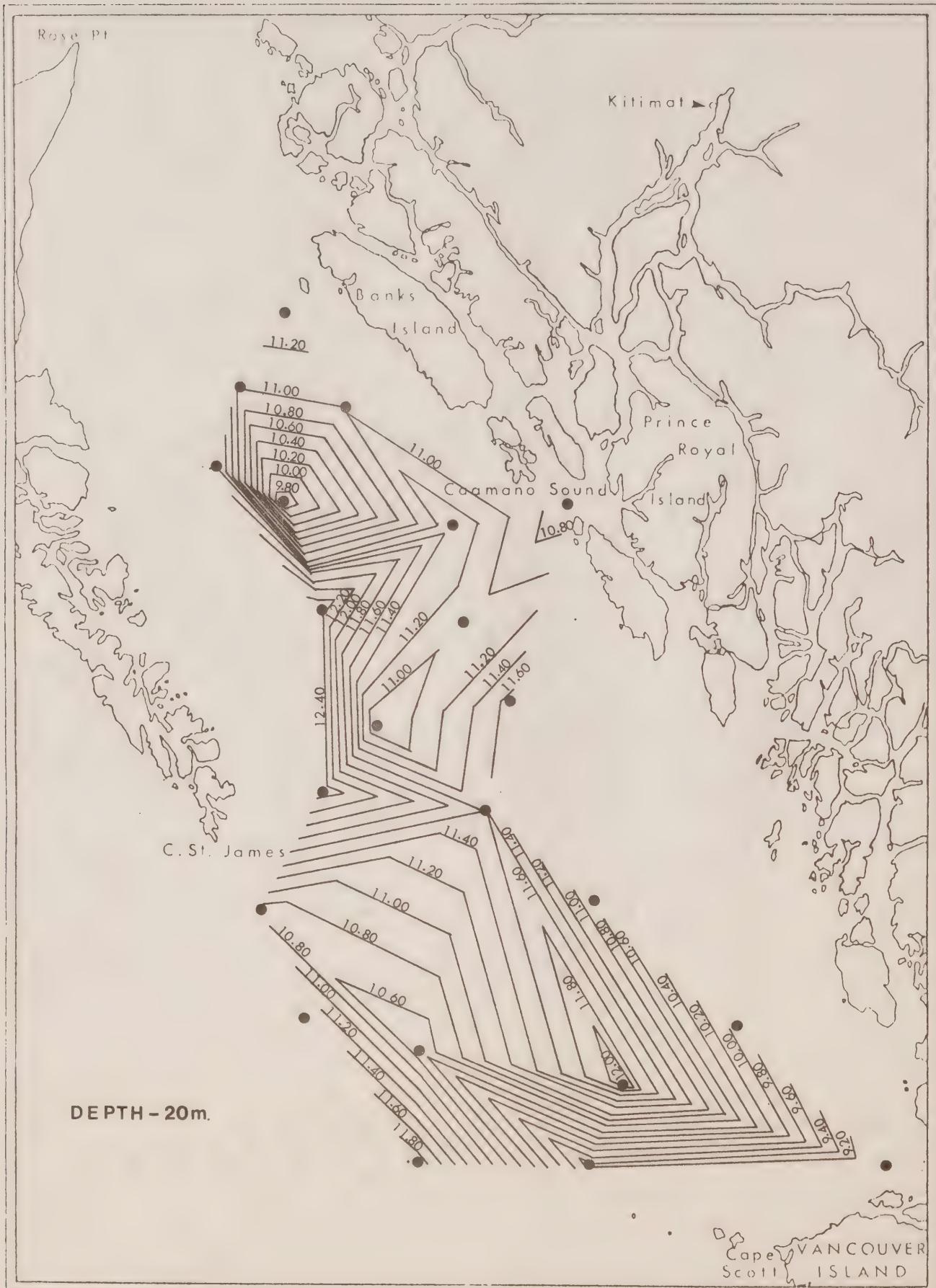
3.2 Cruise 77-13 (July 1977)

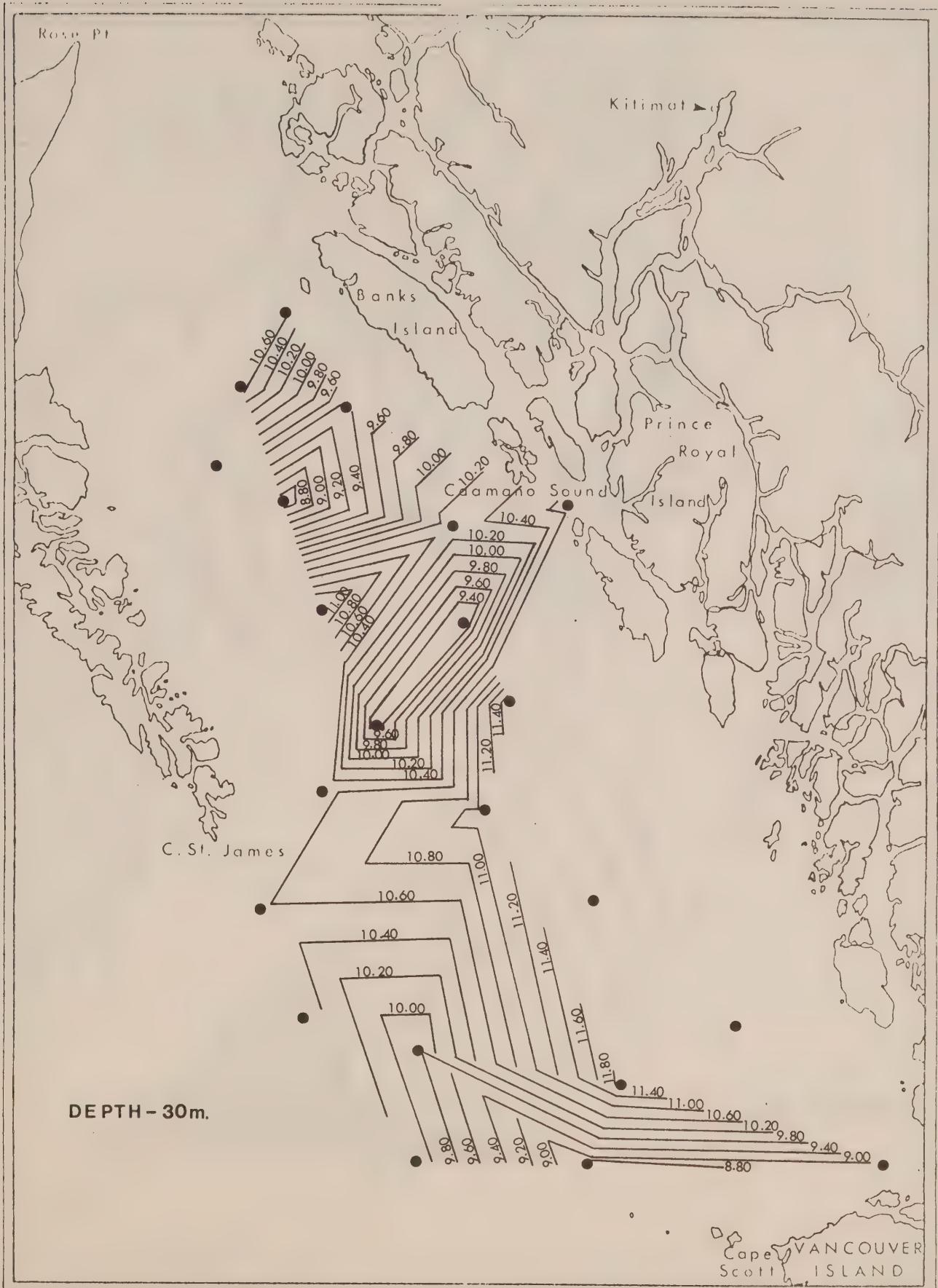
Horizontal sections of temperature, salinity, sigma-t and dissolved oxygen content.

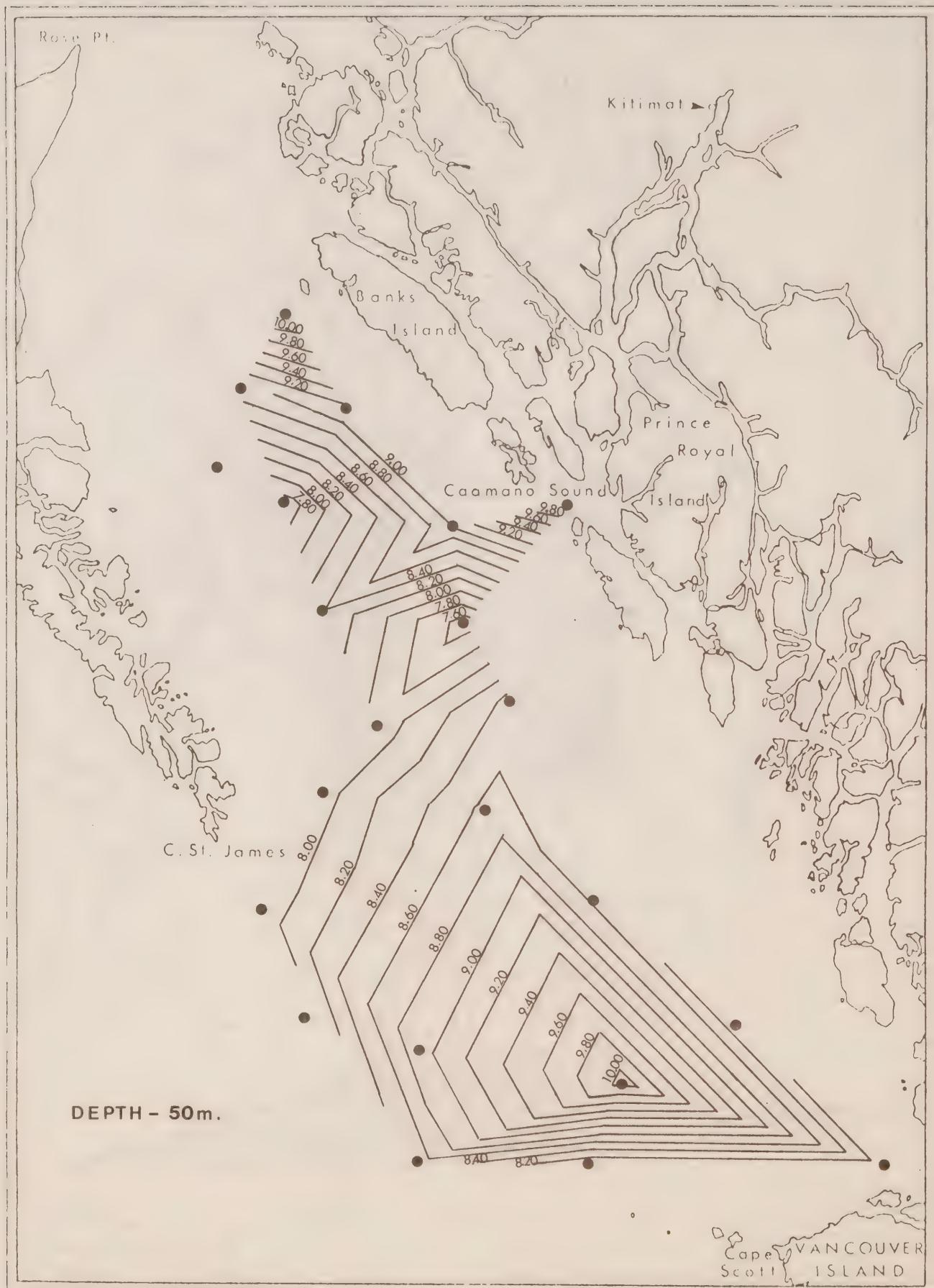
Units: temperature ($^{\circ}\text{C}$); salinity ($^{\circ}/\text{oo}$); dissolved oxygen (mL/L).

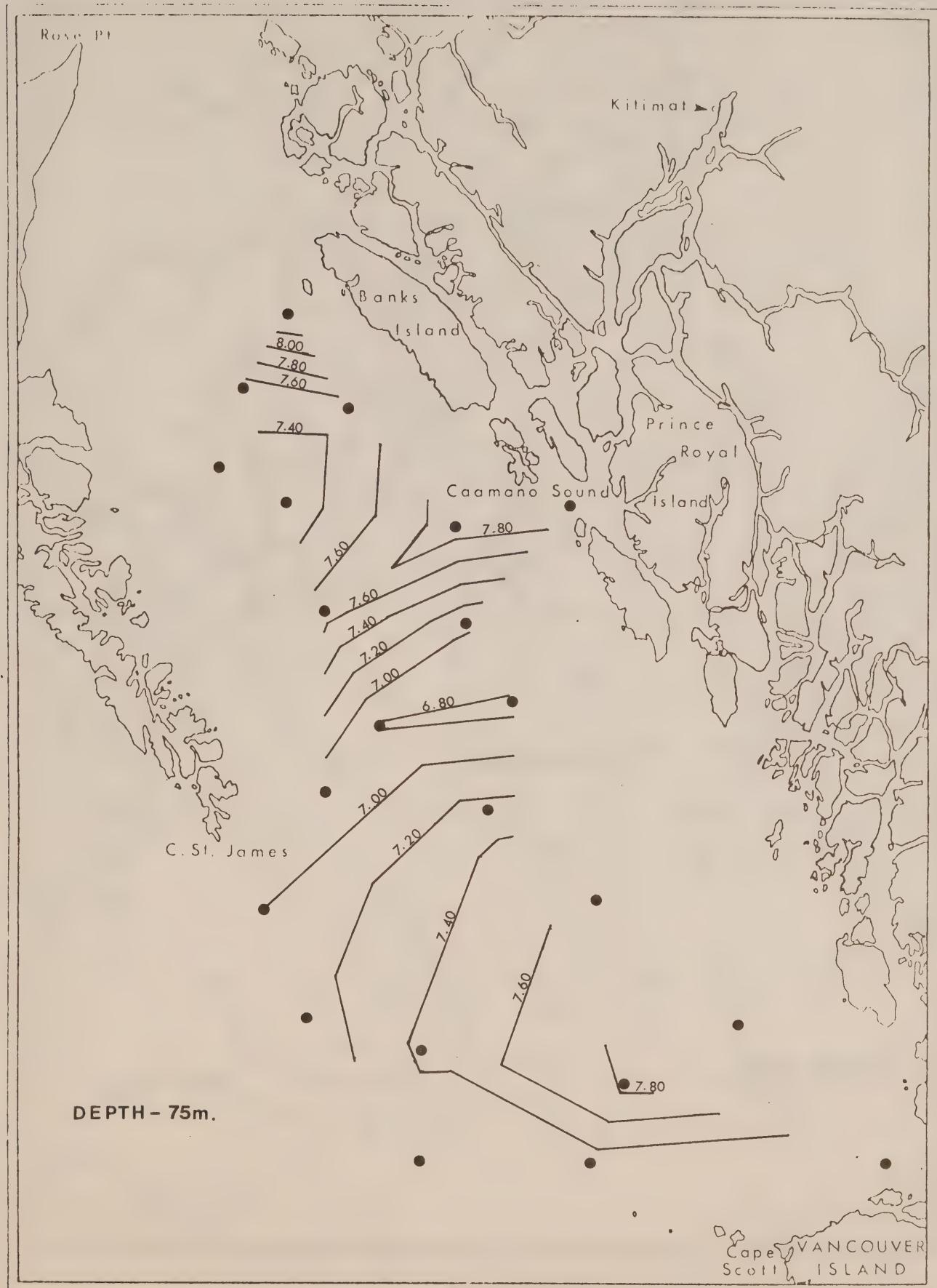
TEMPERATURE
($^{\circ}\text{C}$)



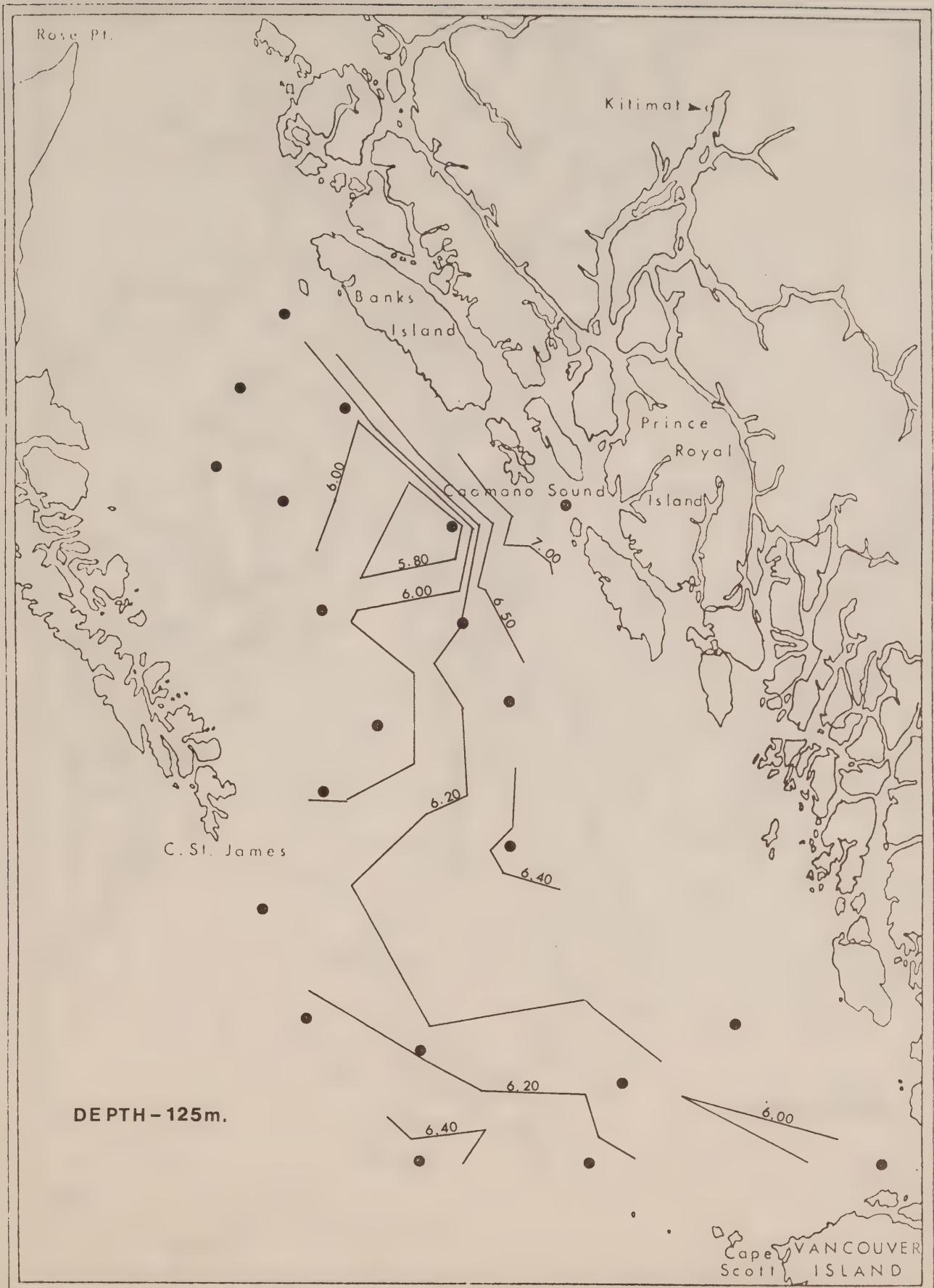


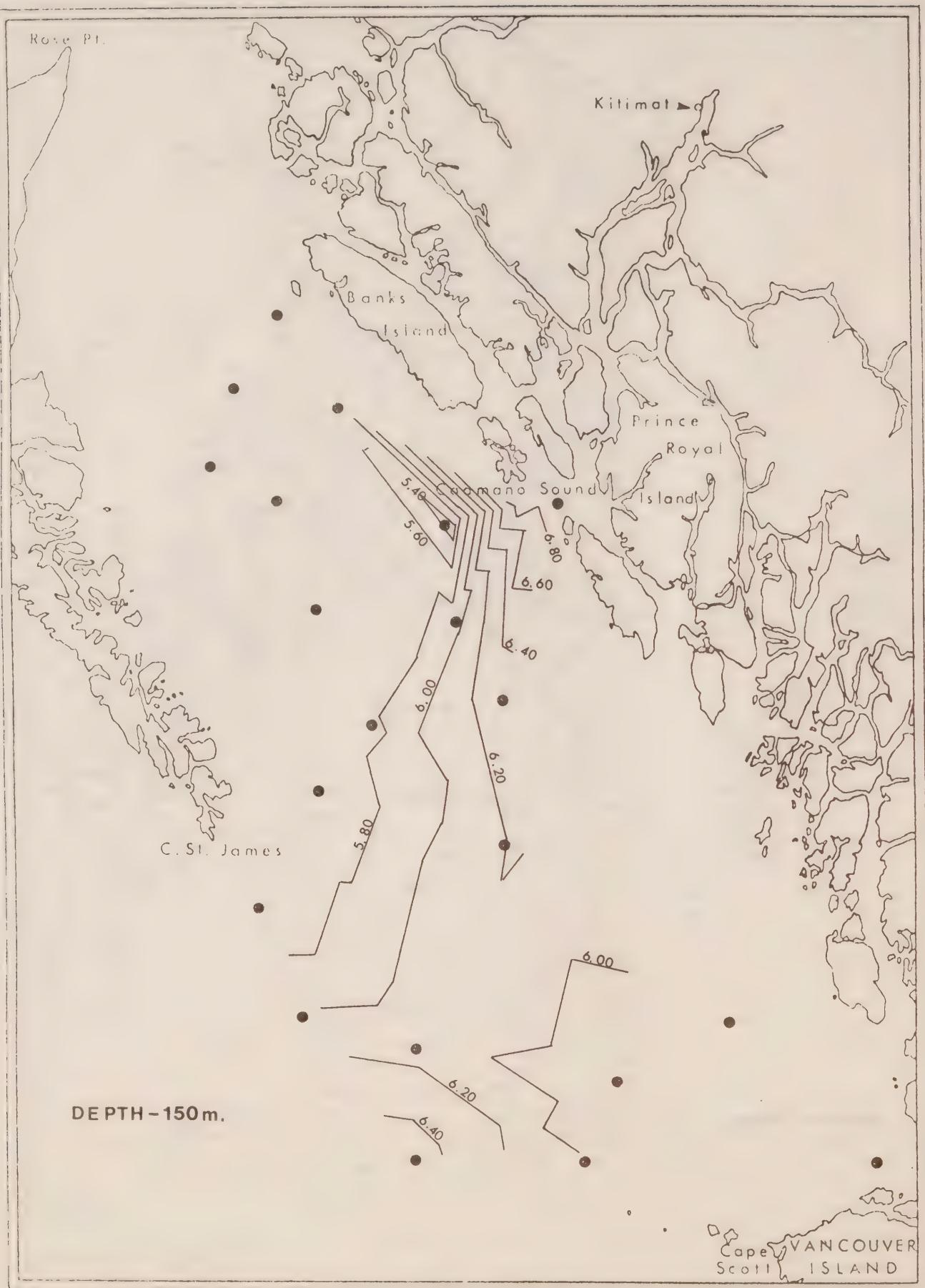


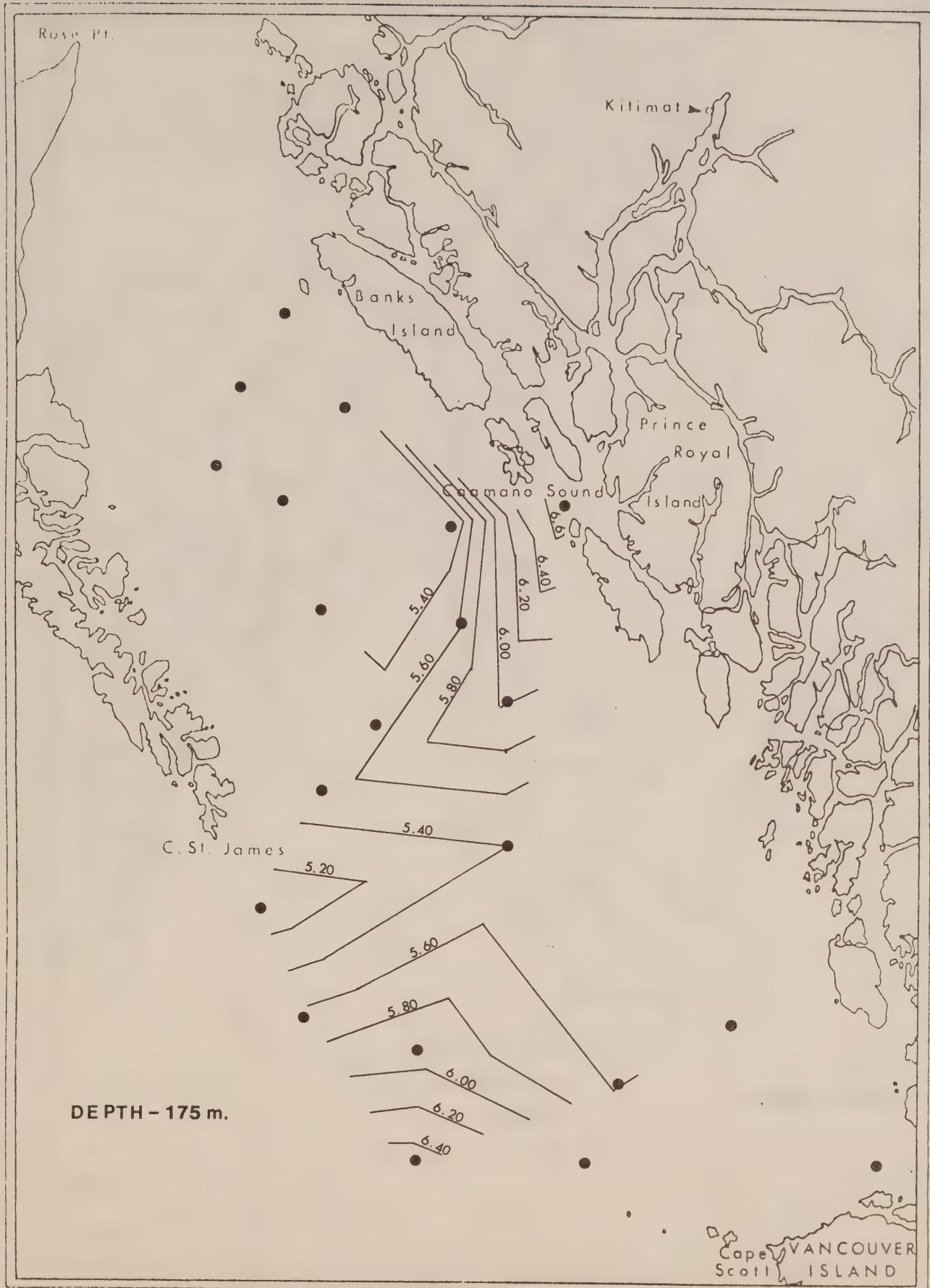


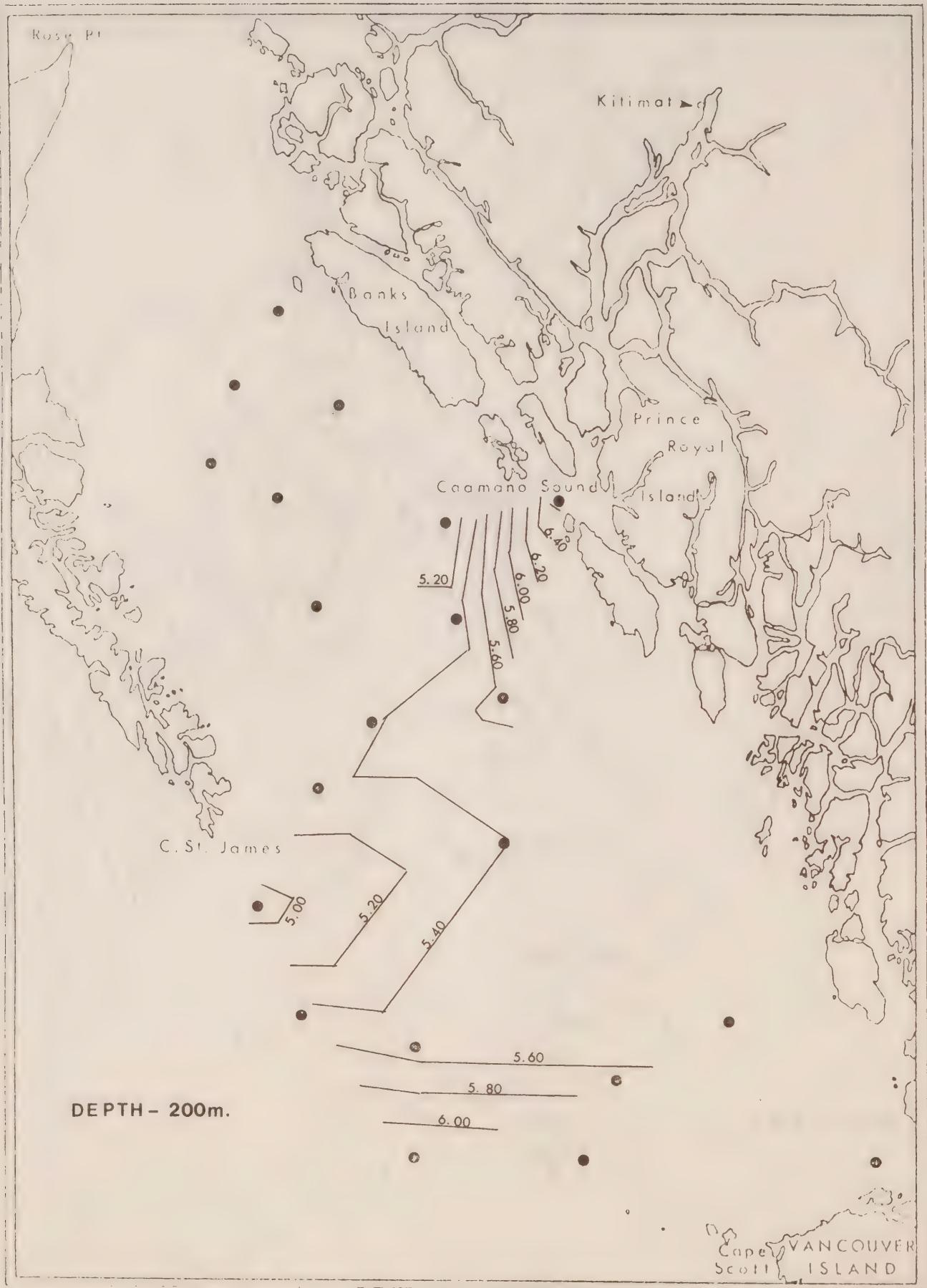


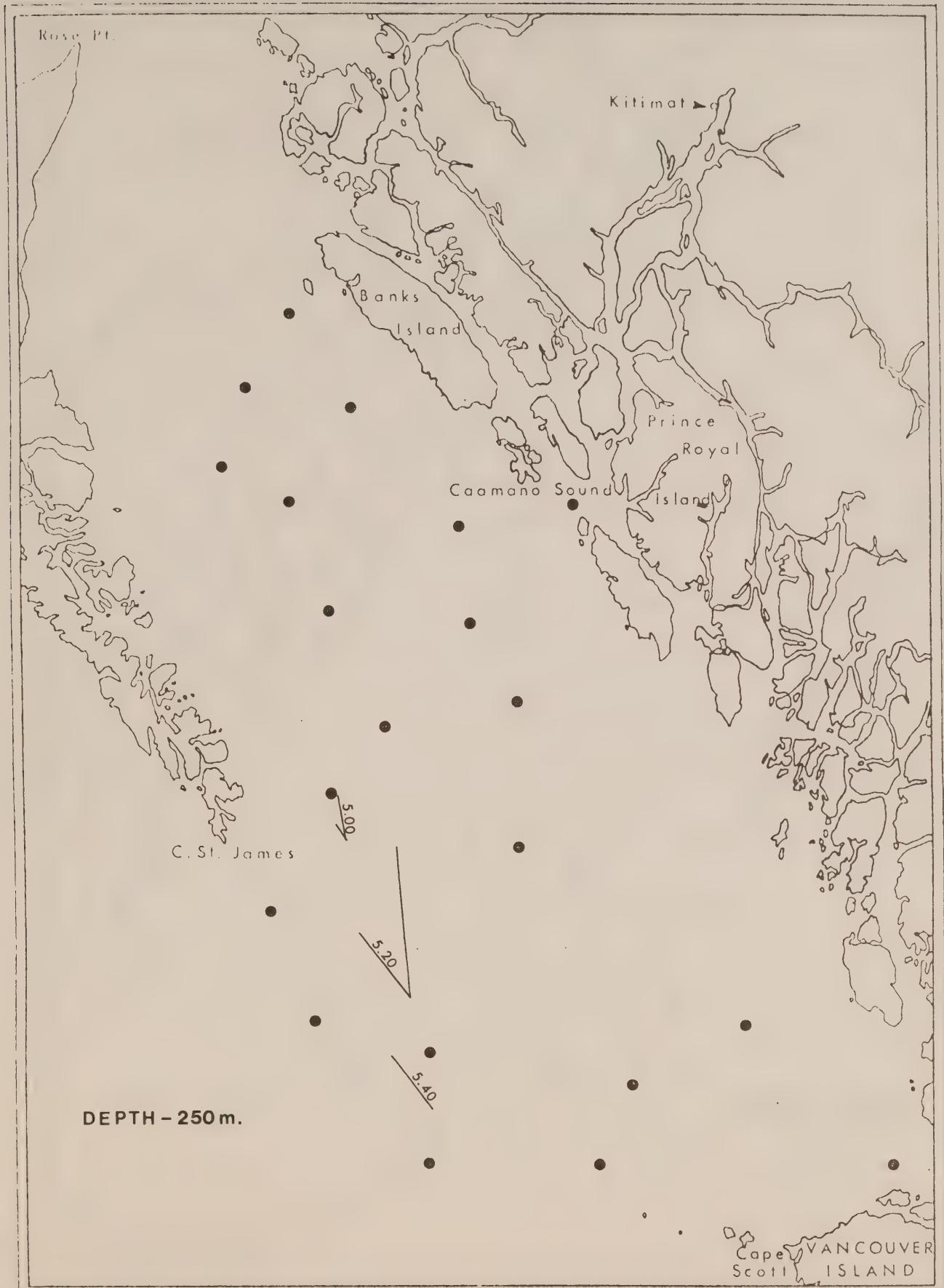


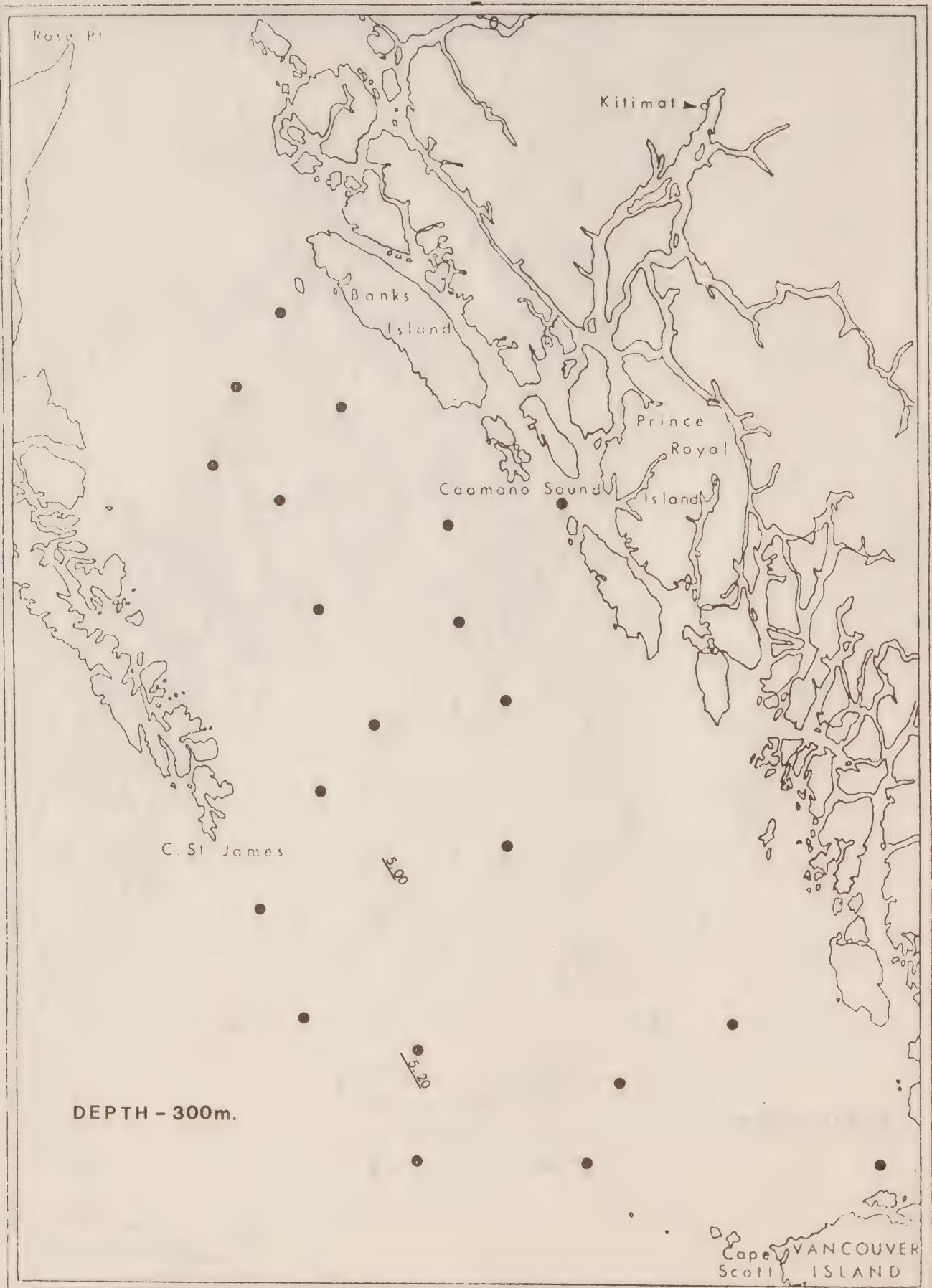


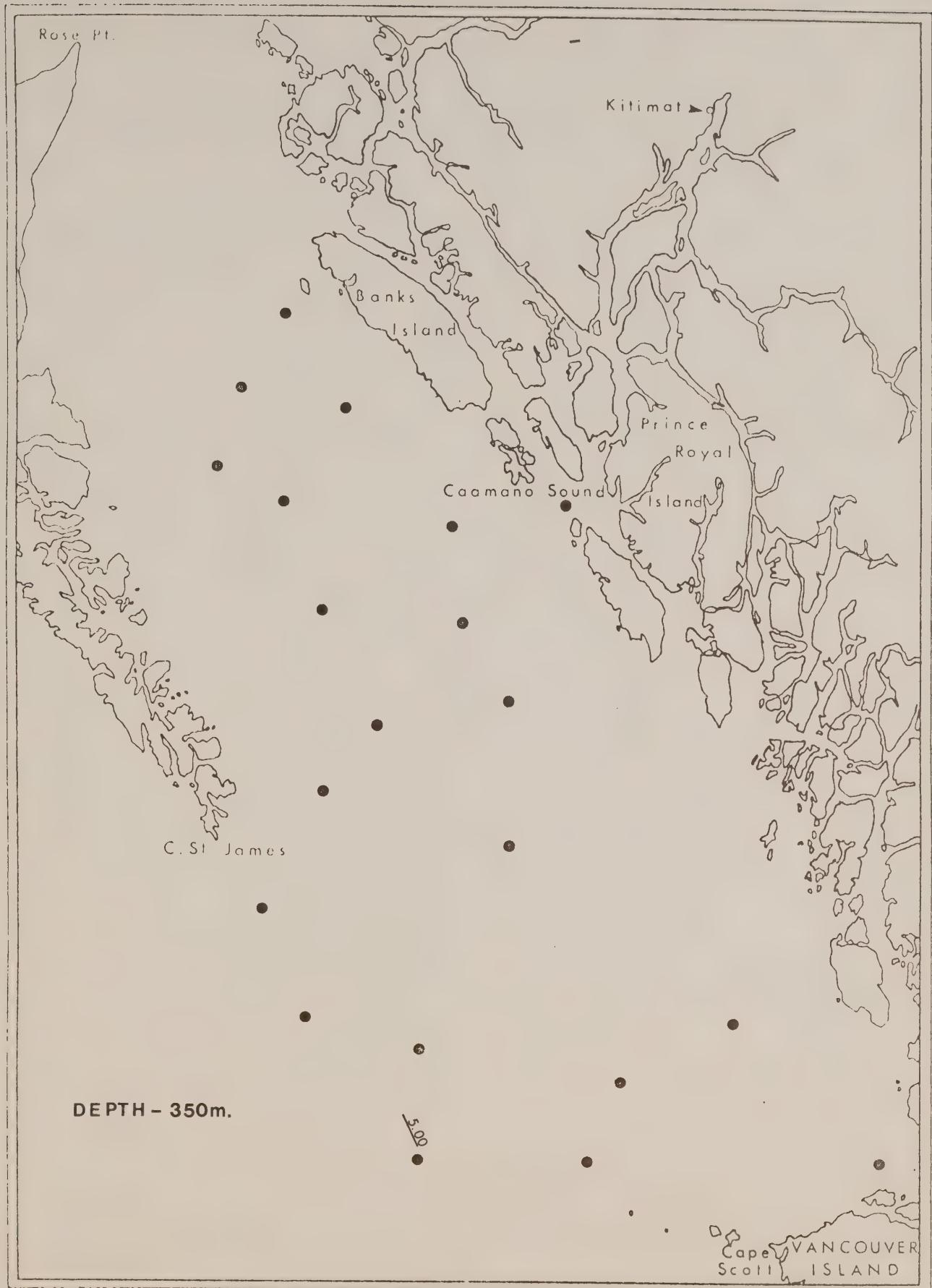




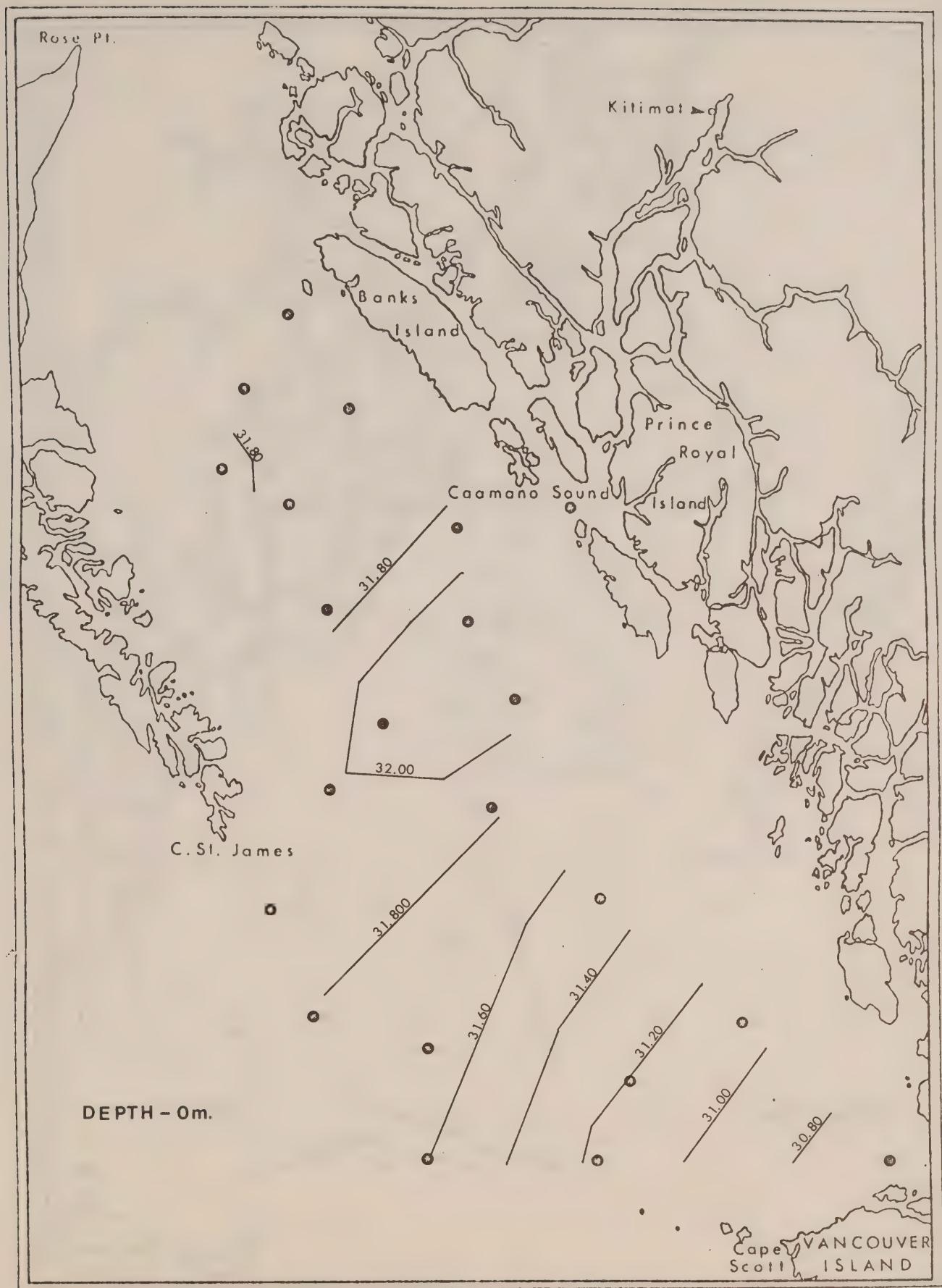


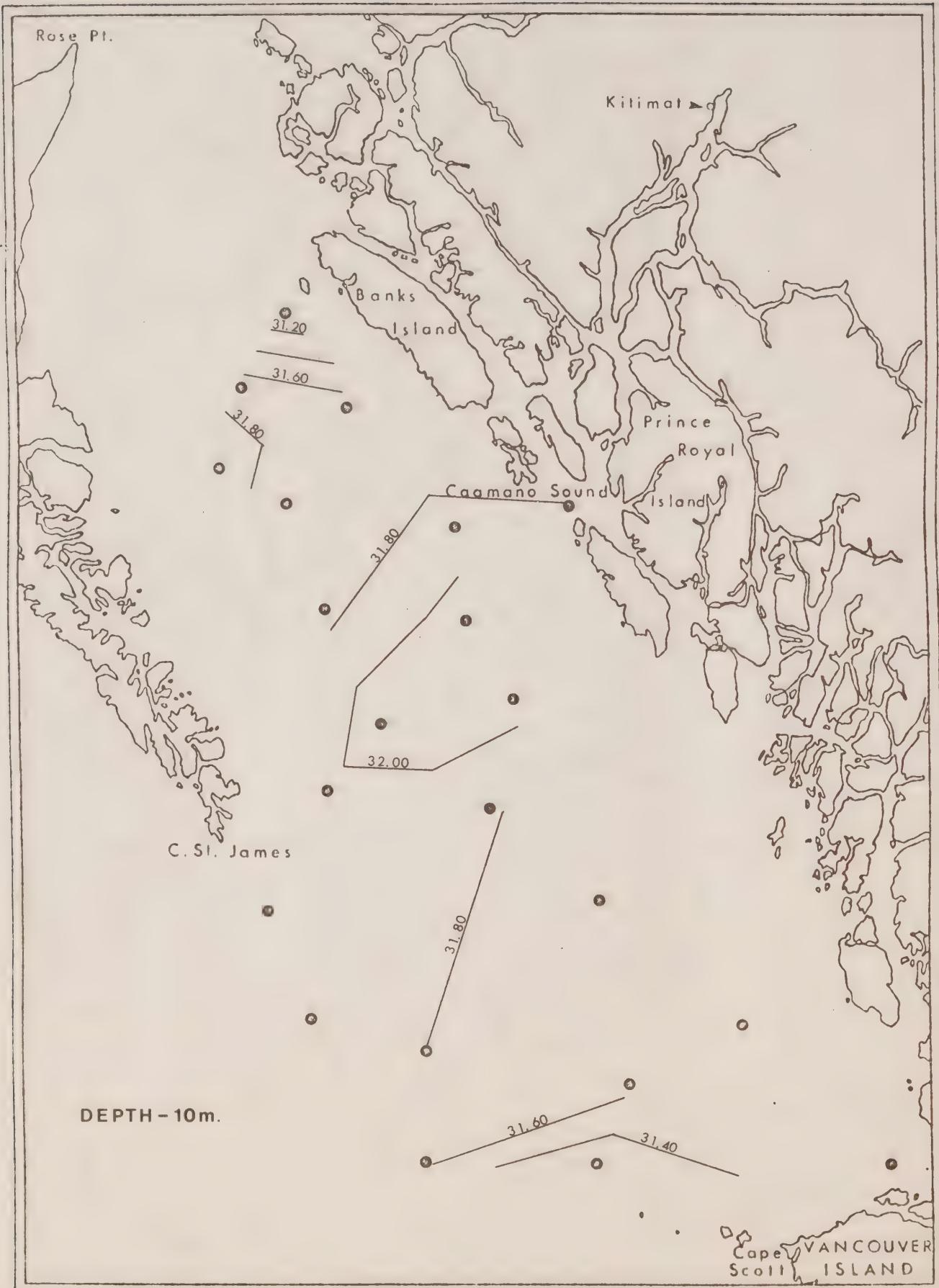


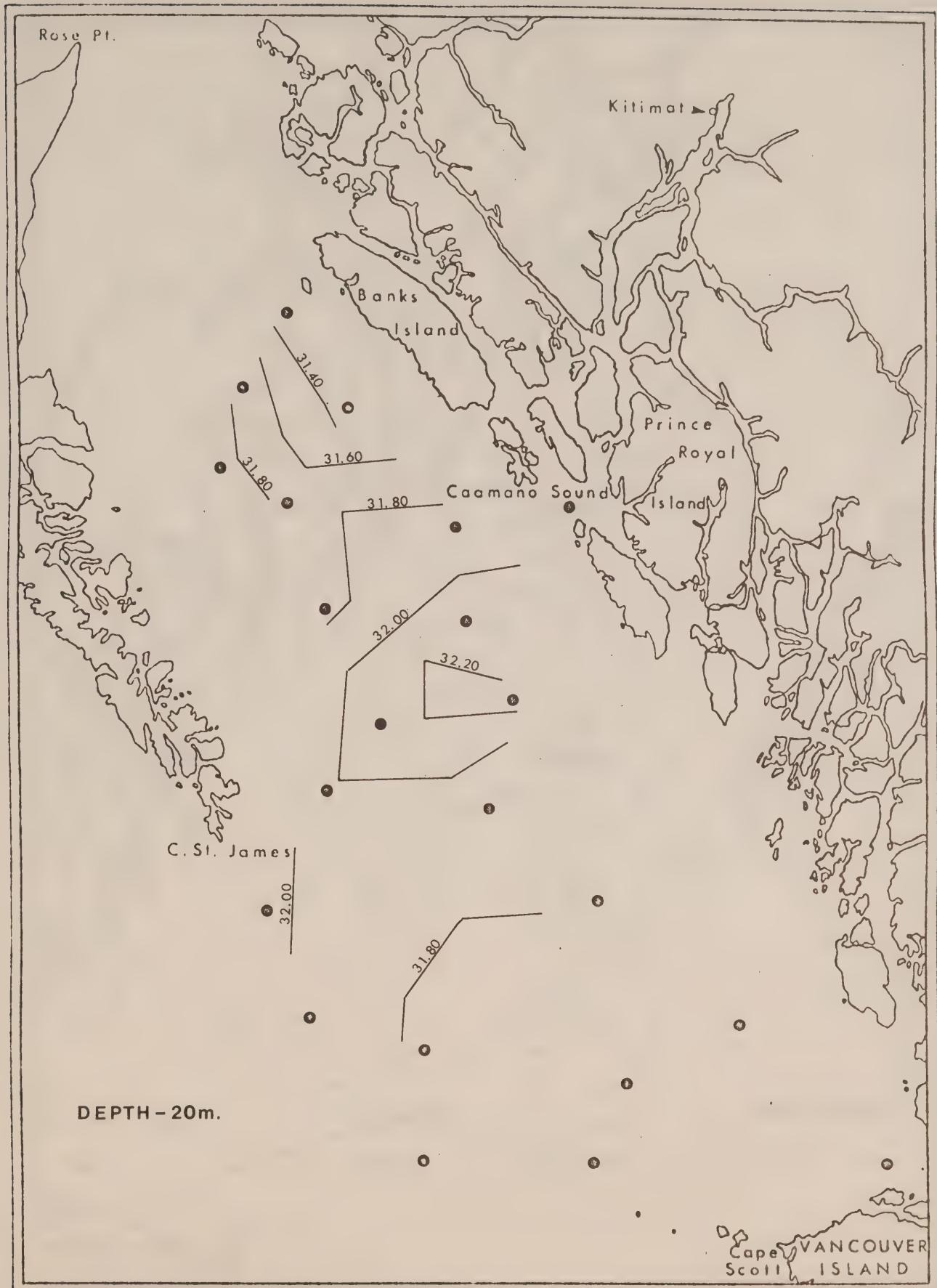


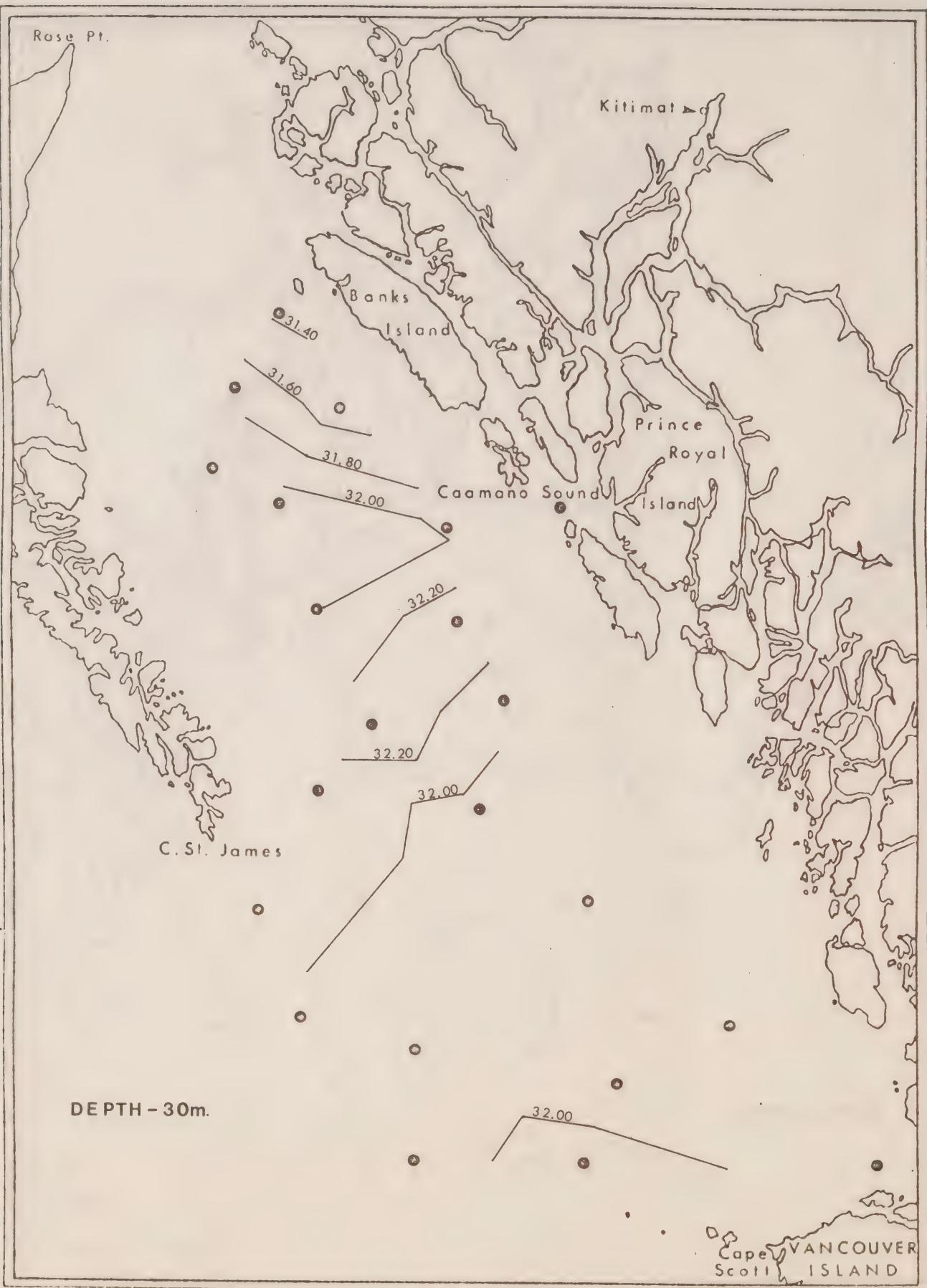


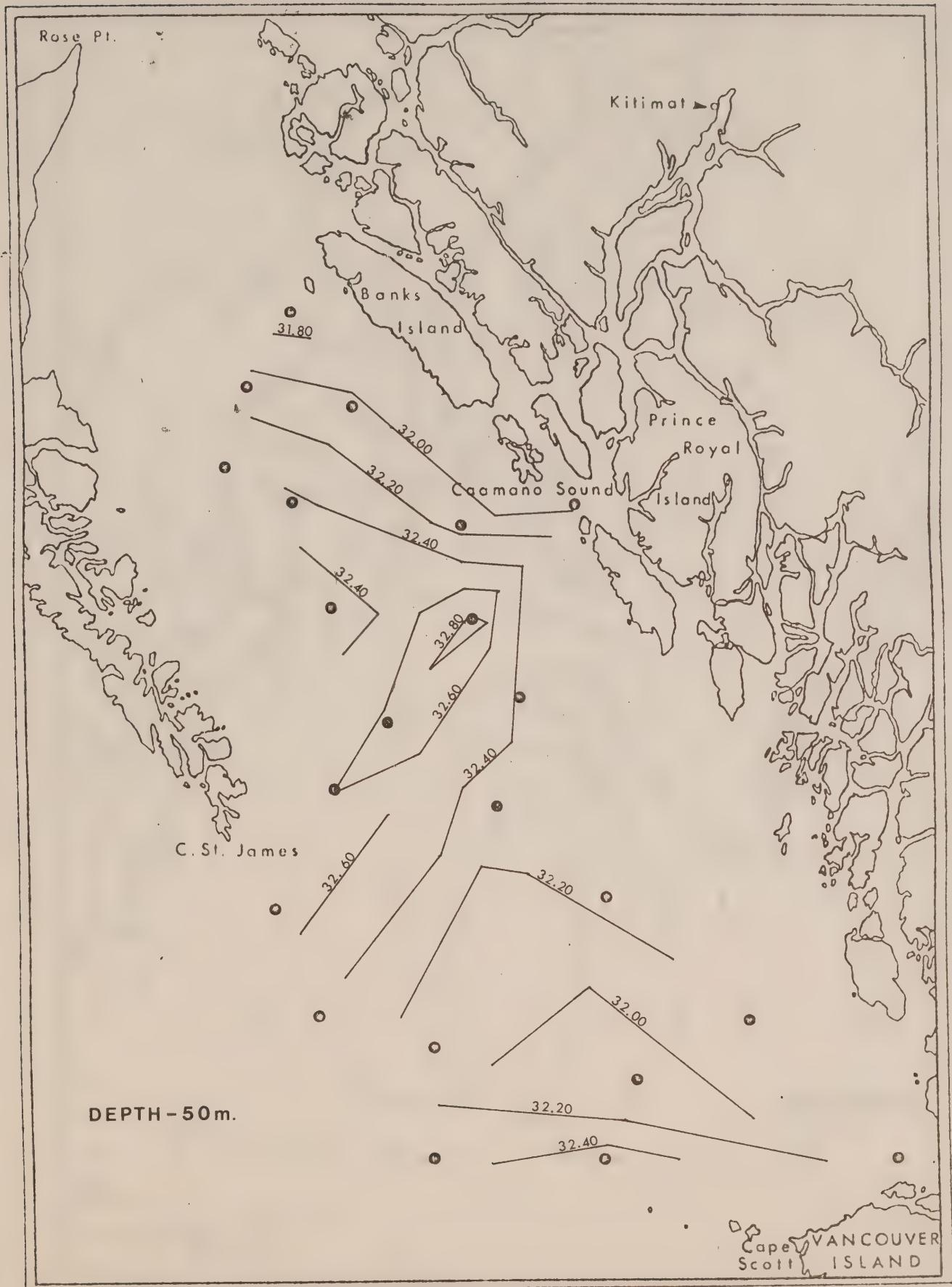
SALINITY
($^{\circ}$ /oo)

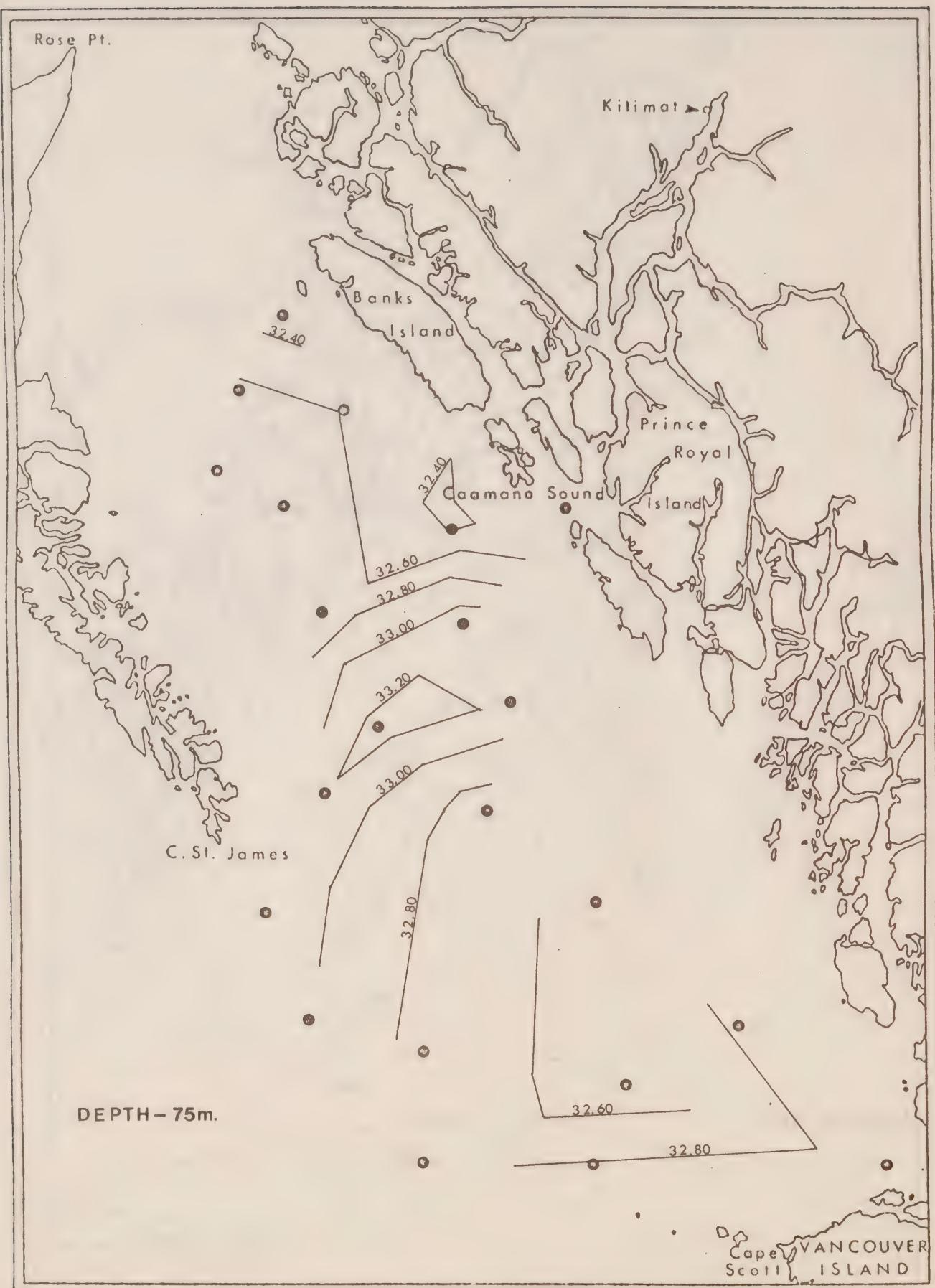


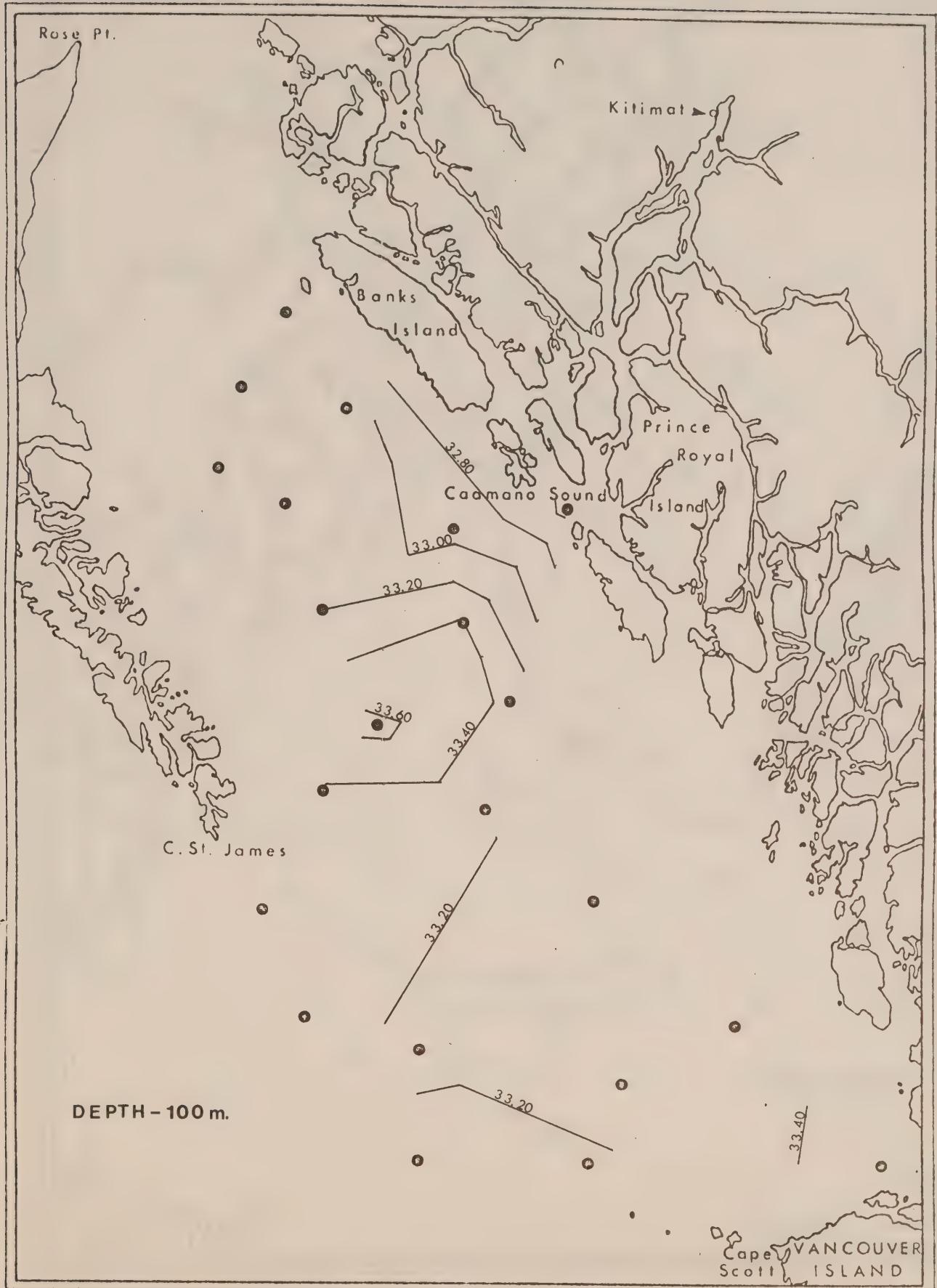


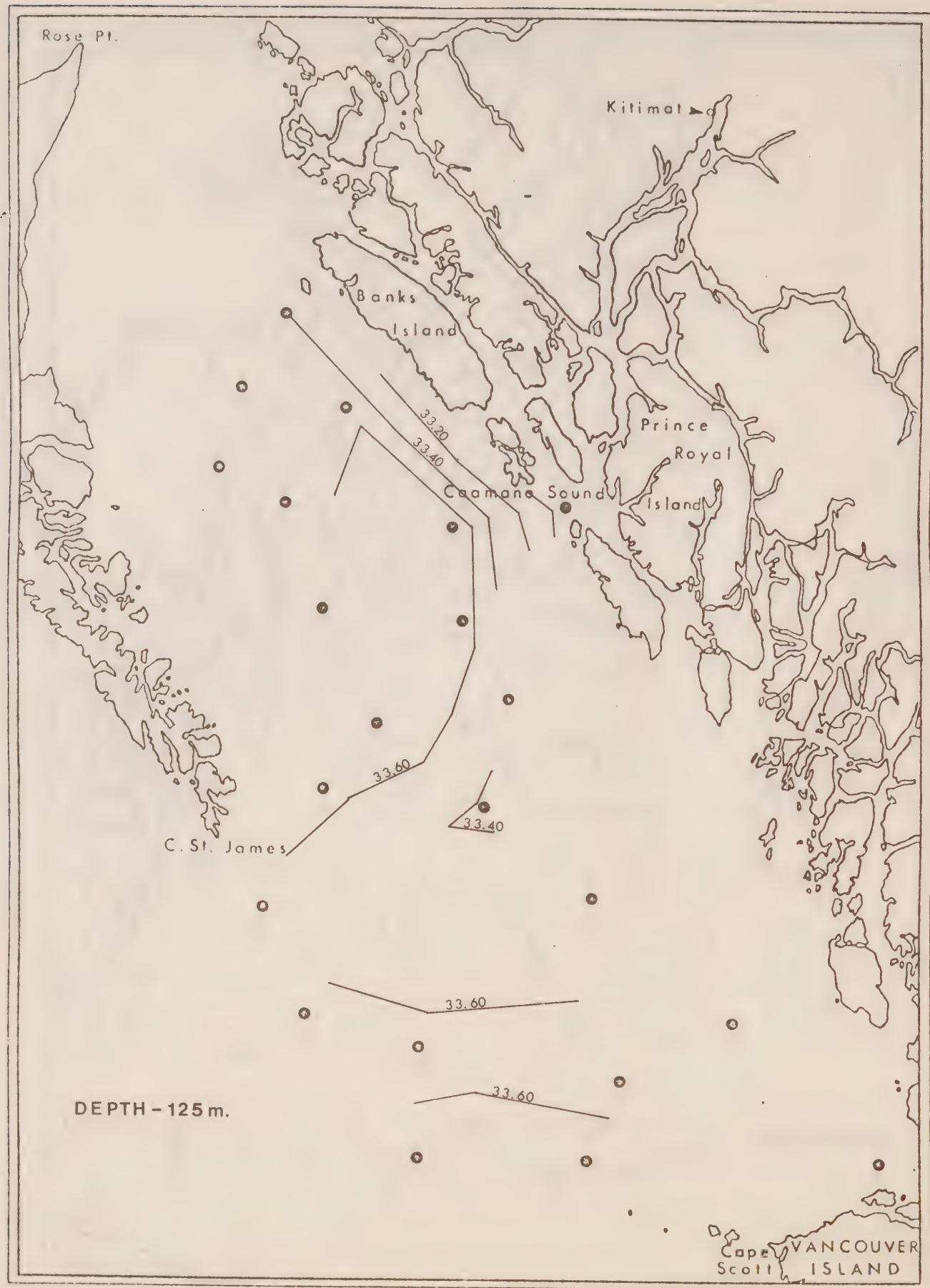


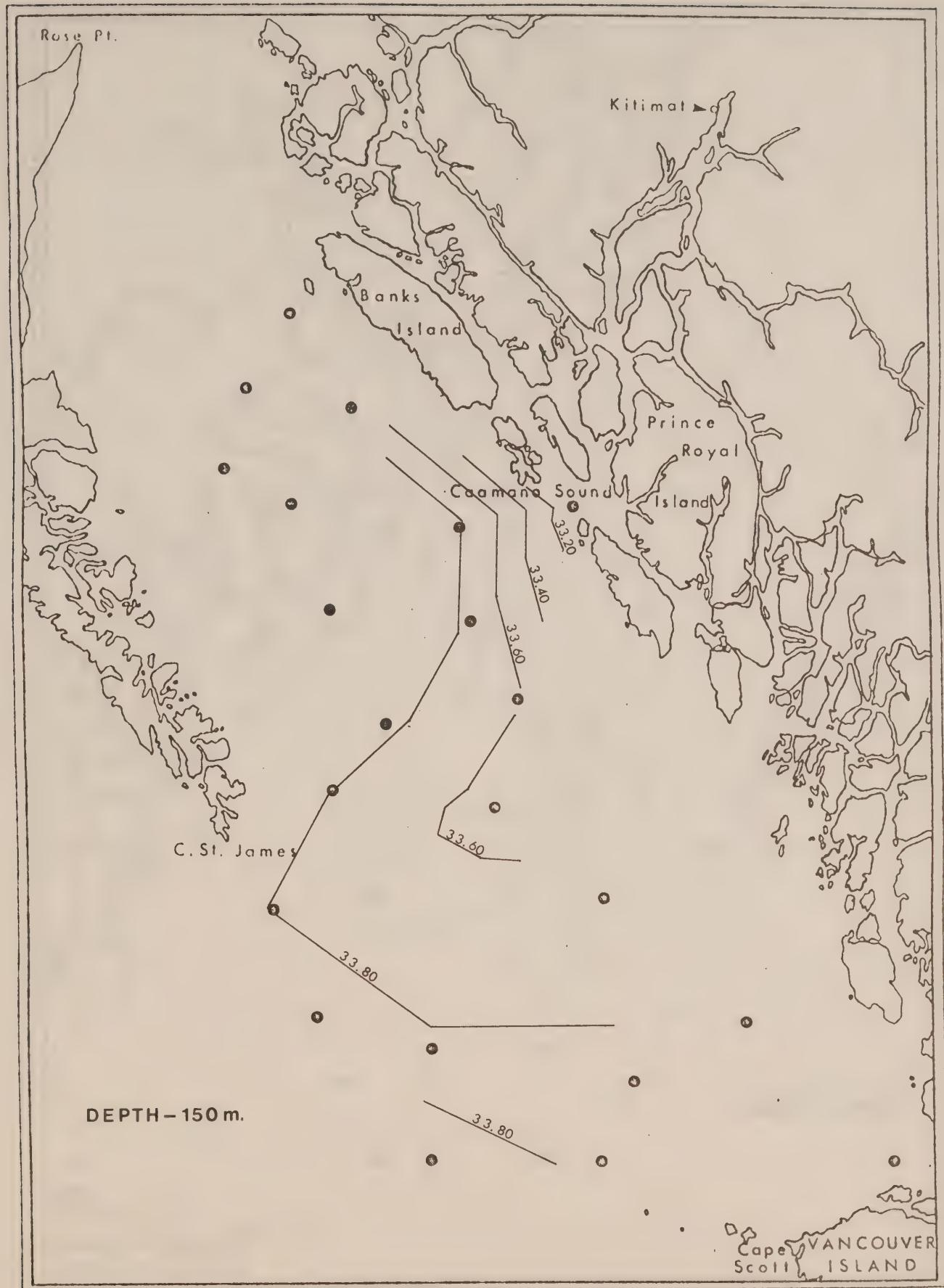


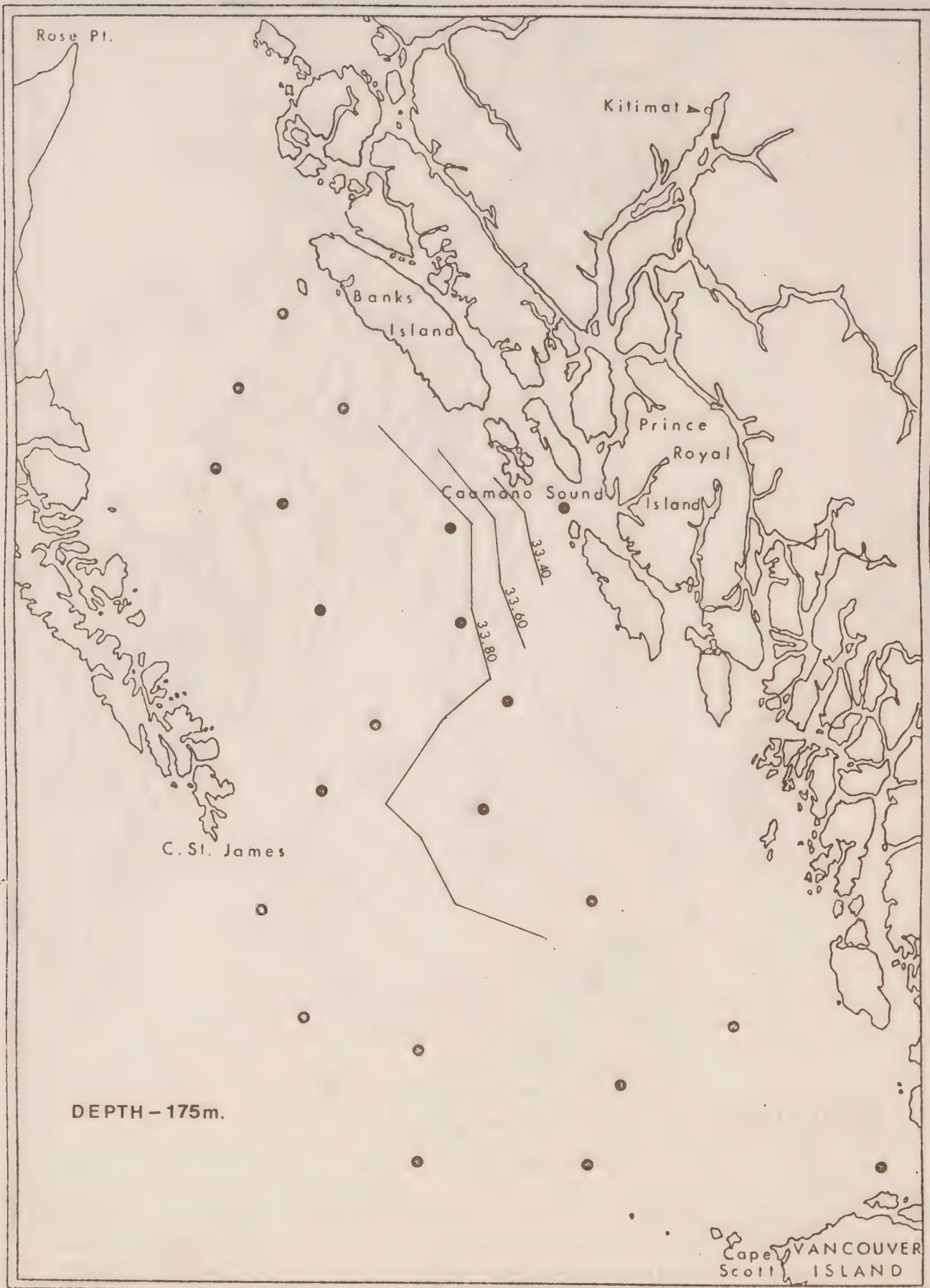


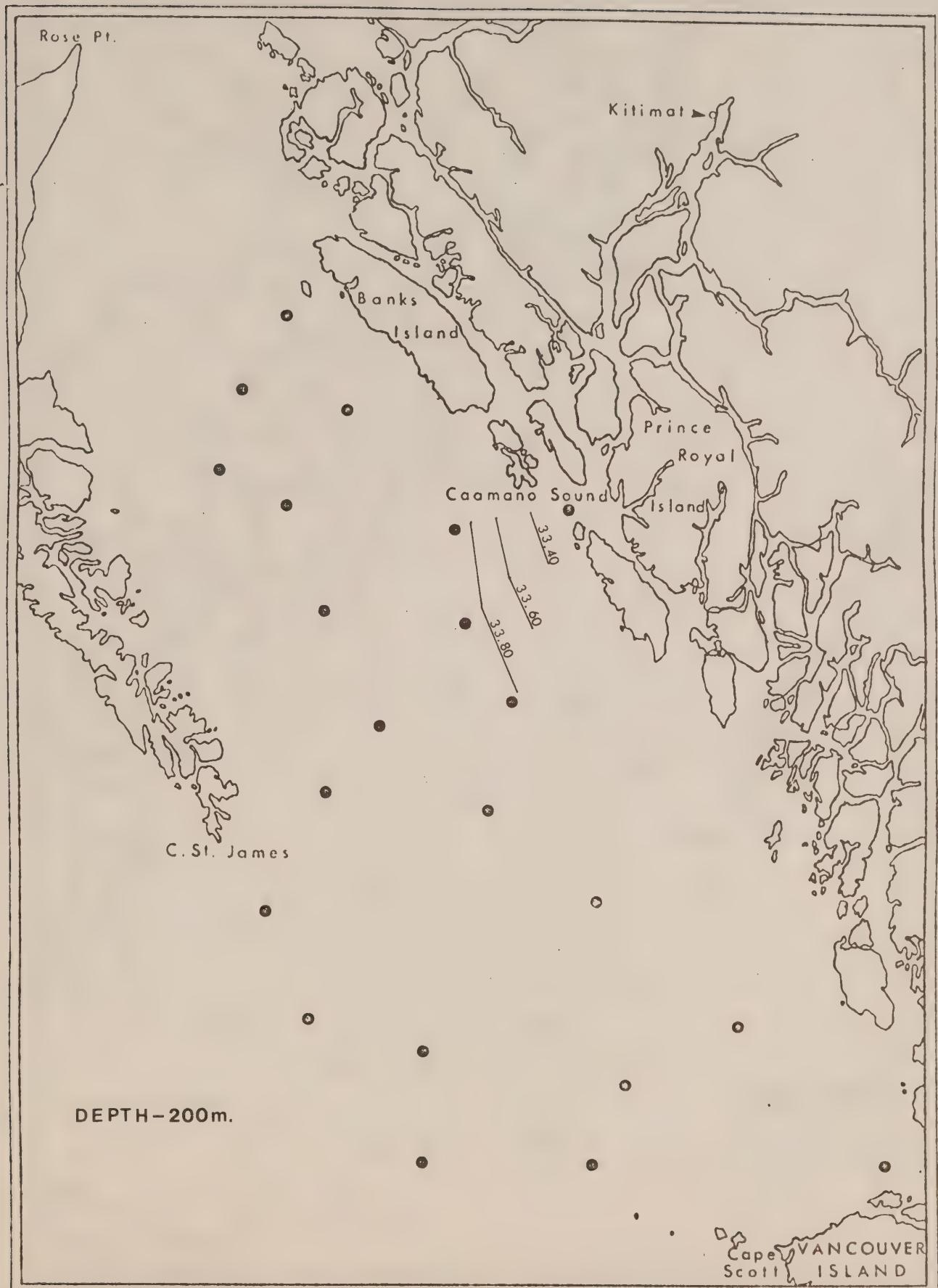


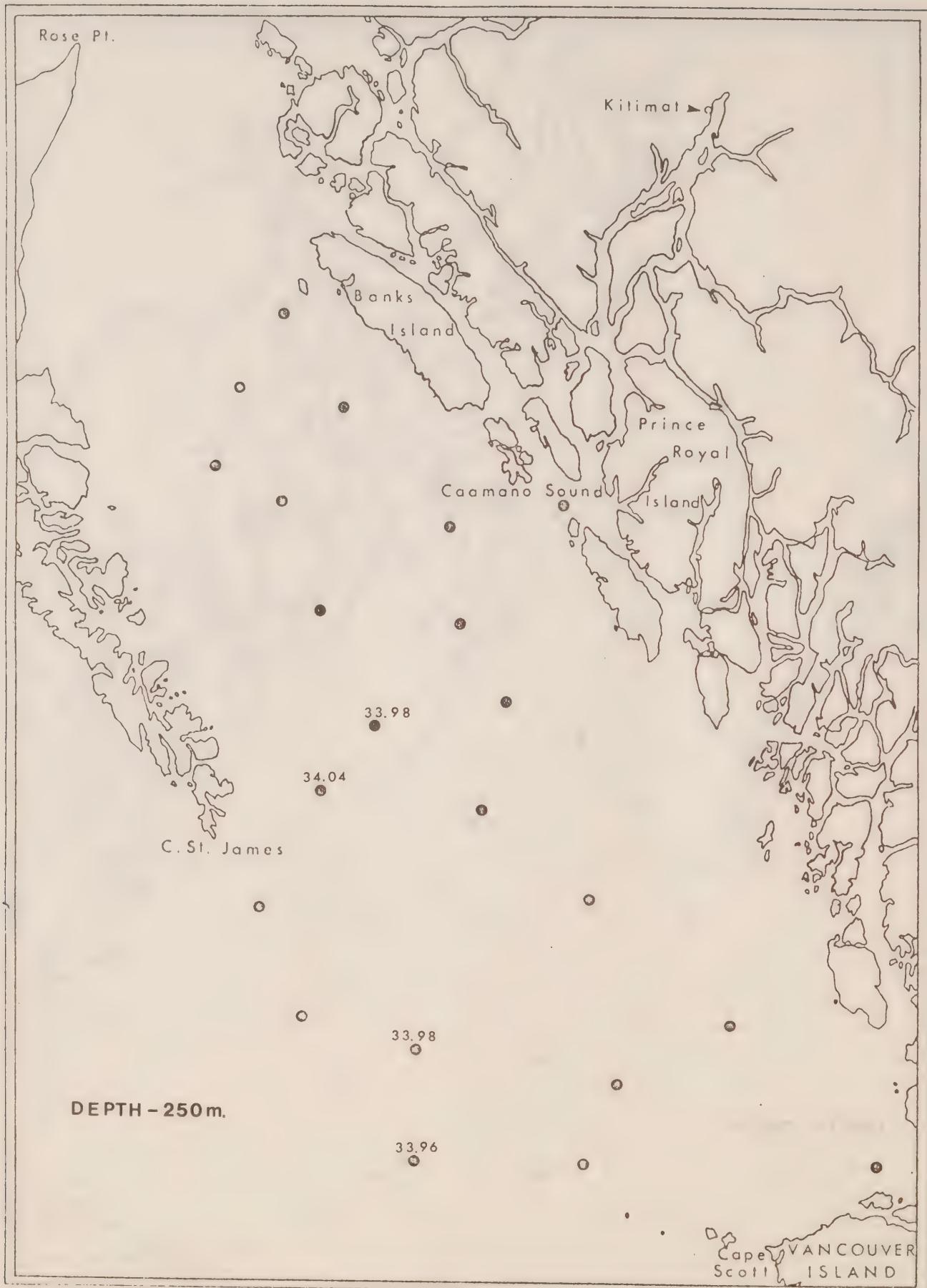


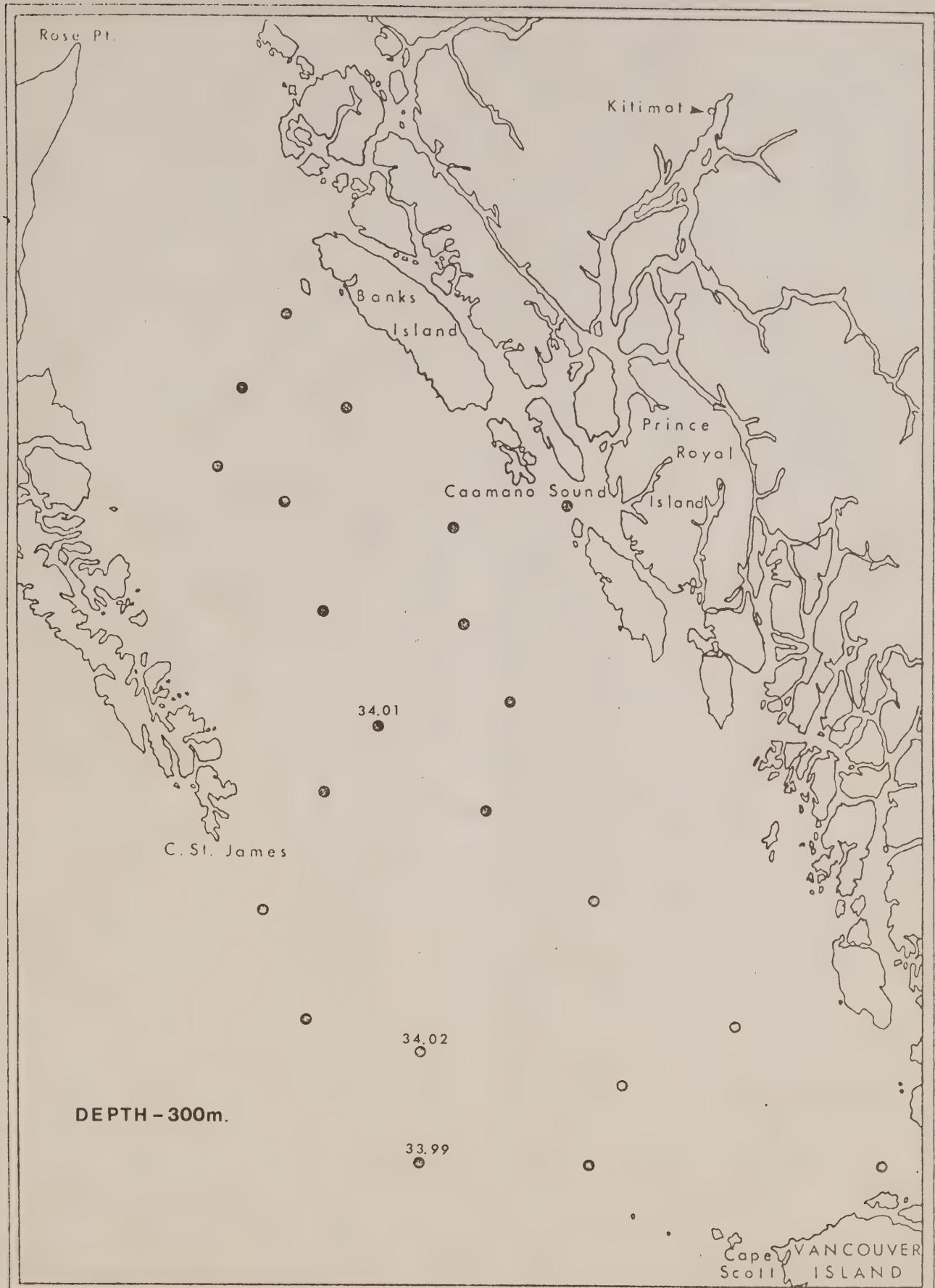


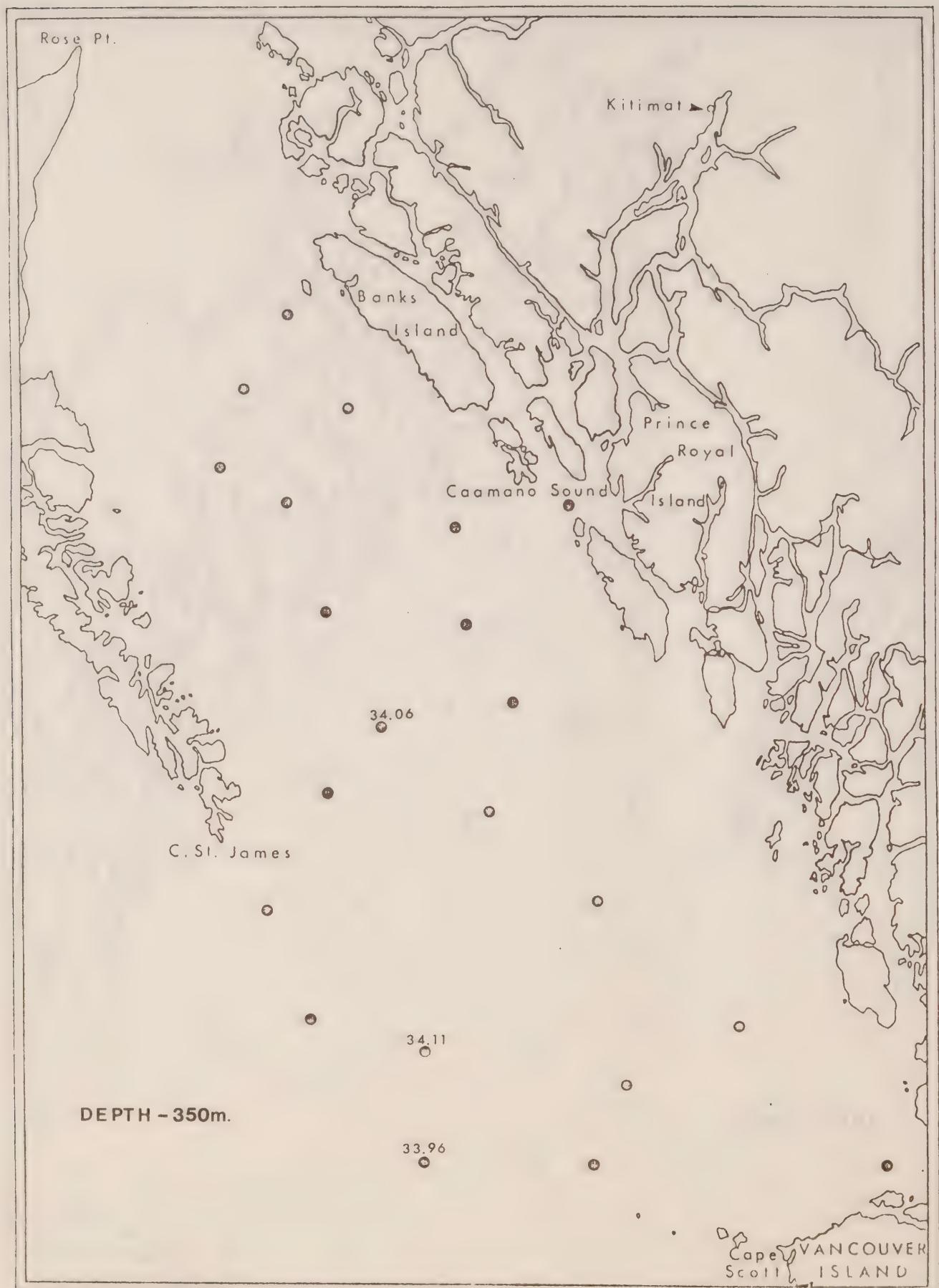




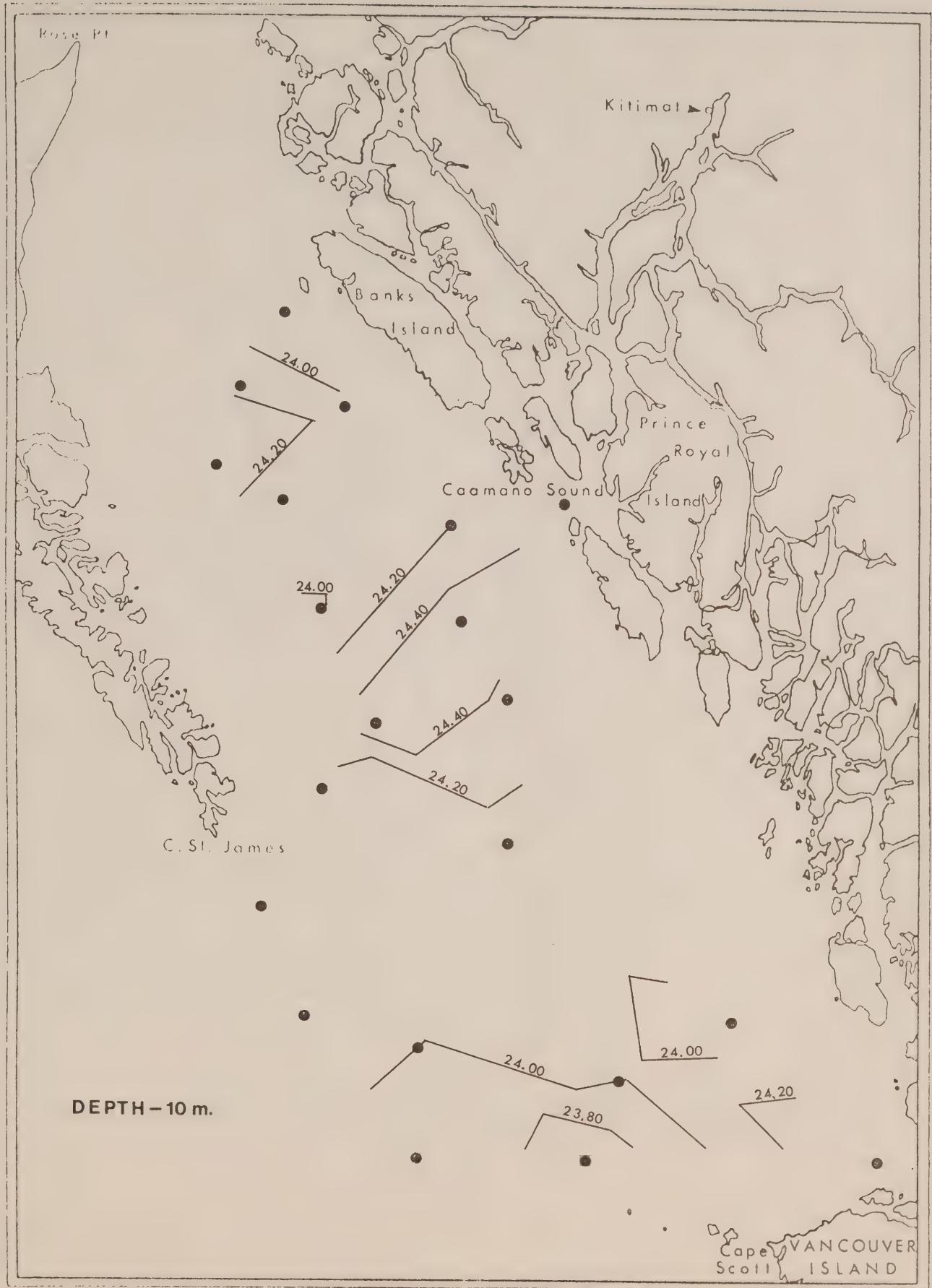


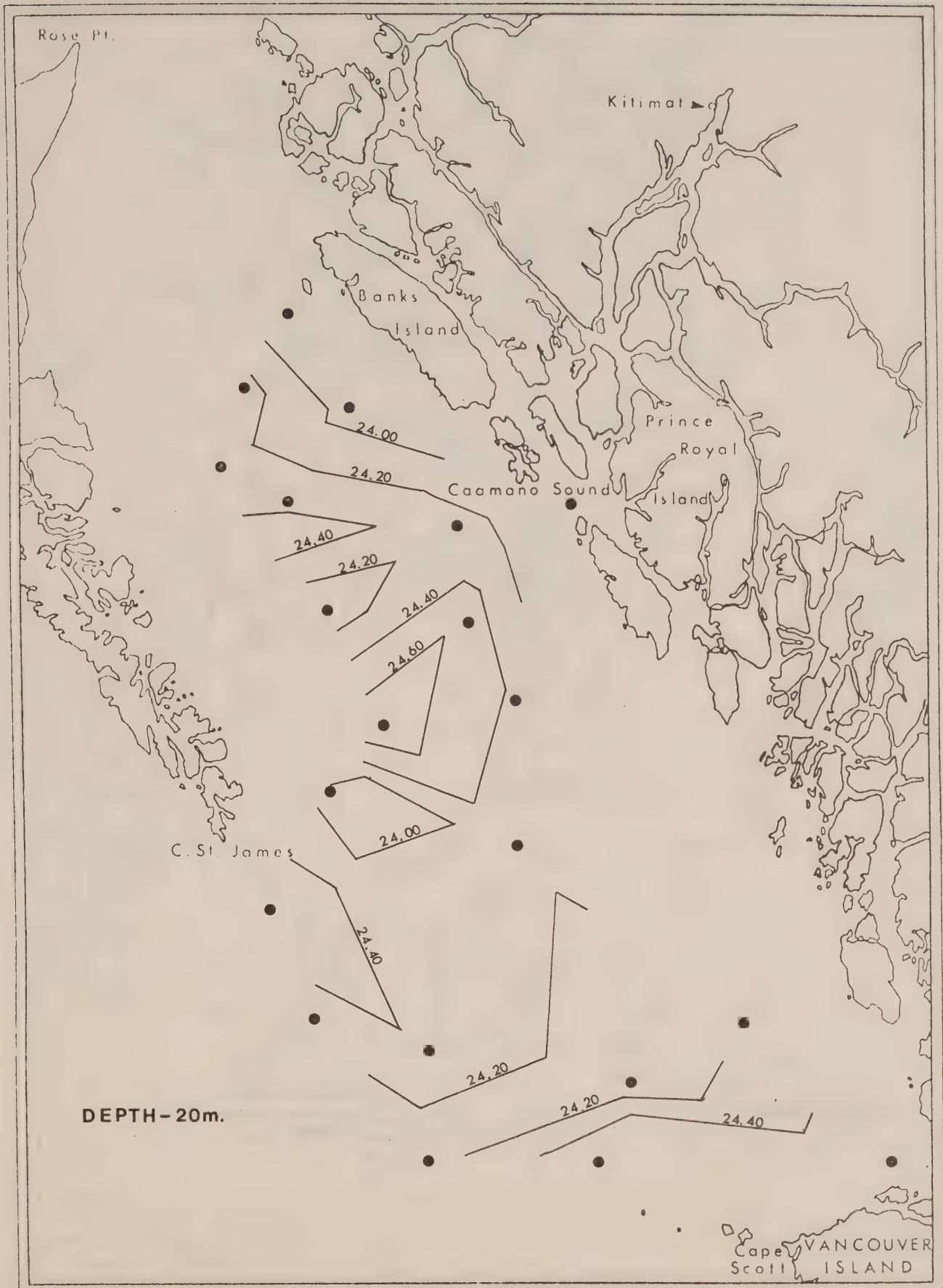




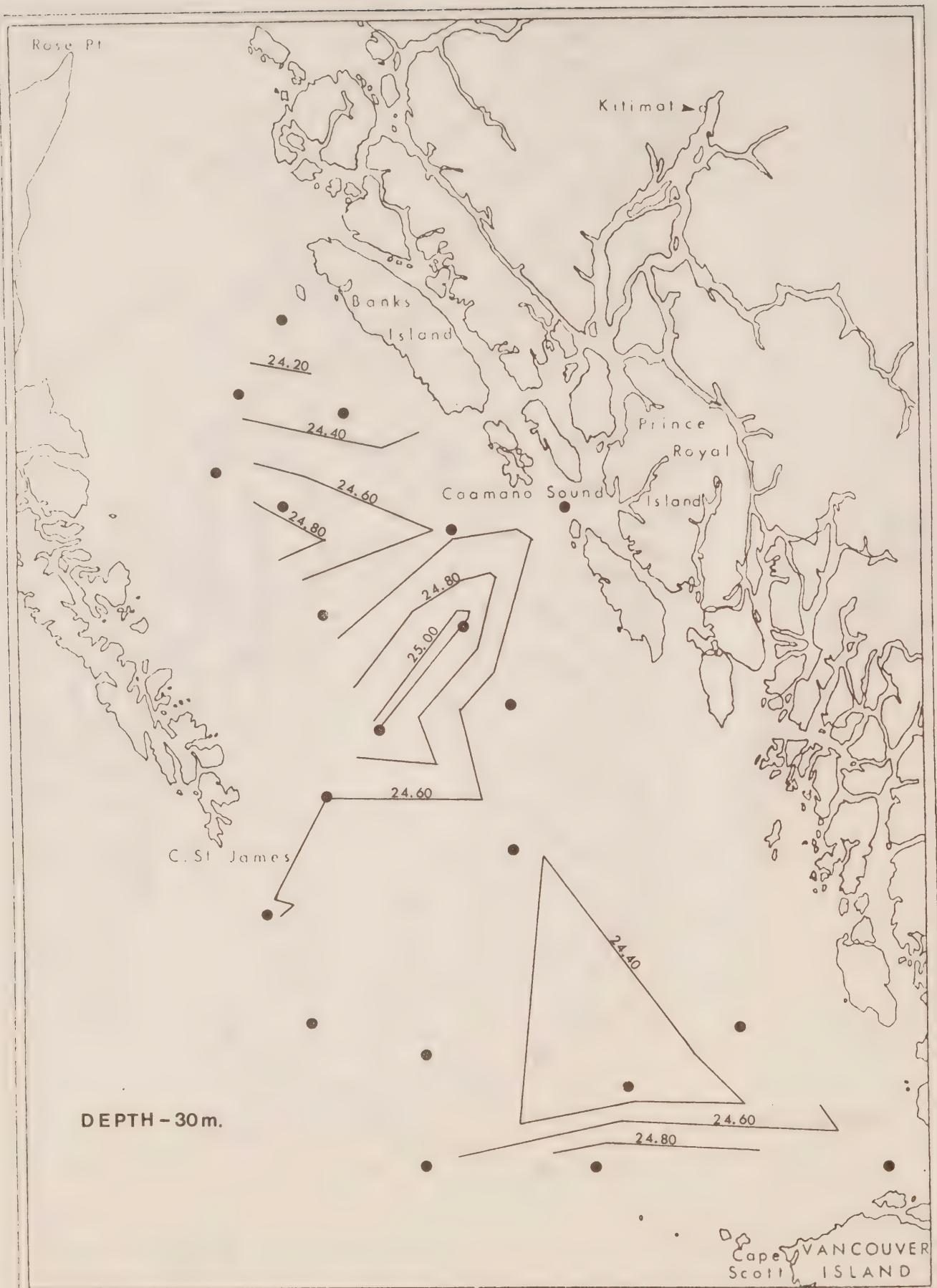


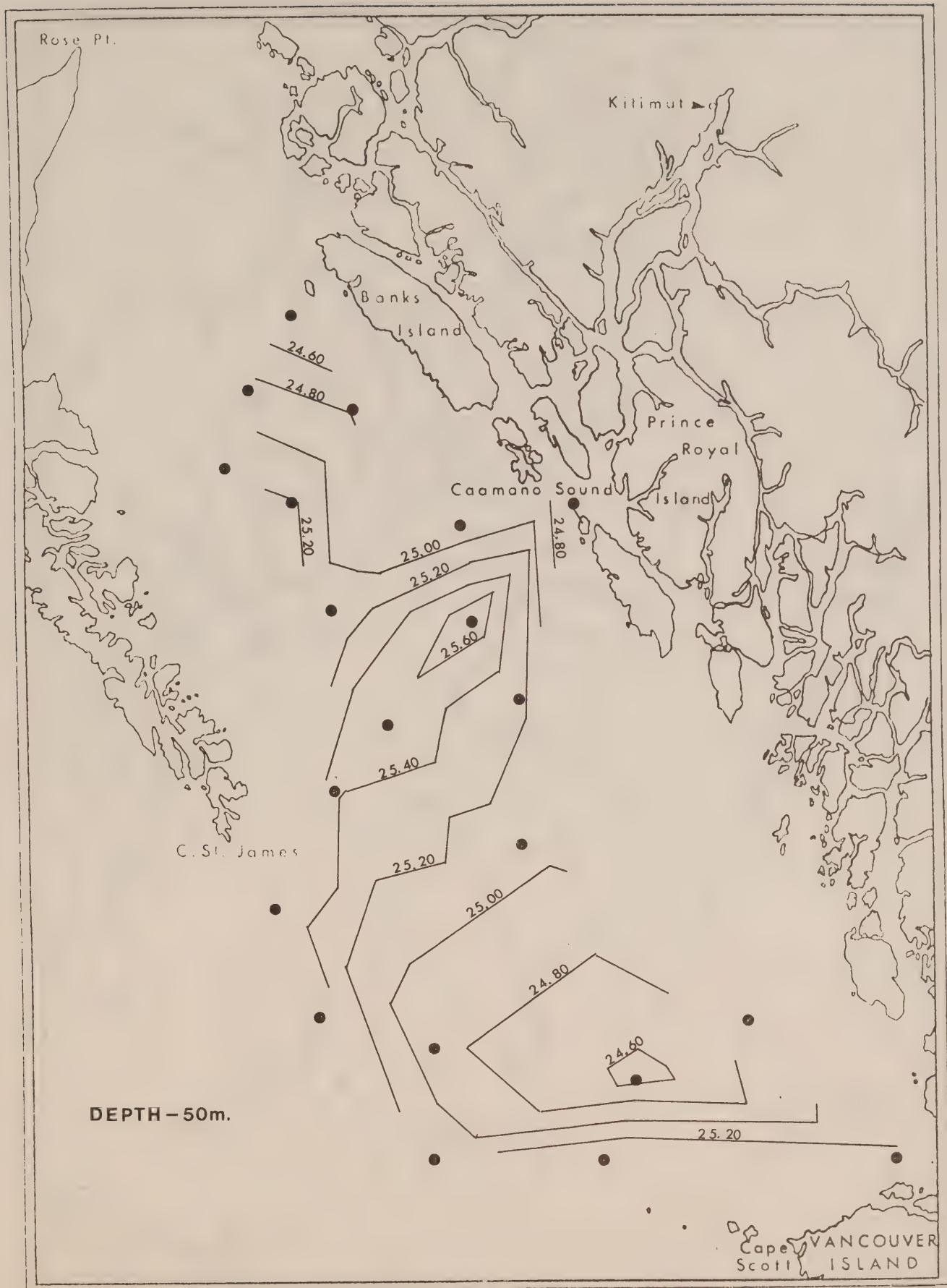
SIGMA-t



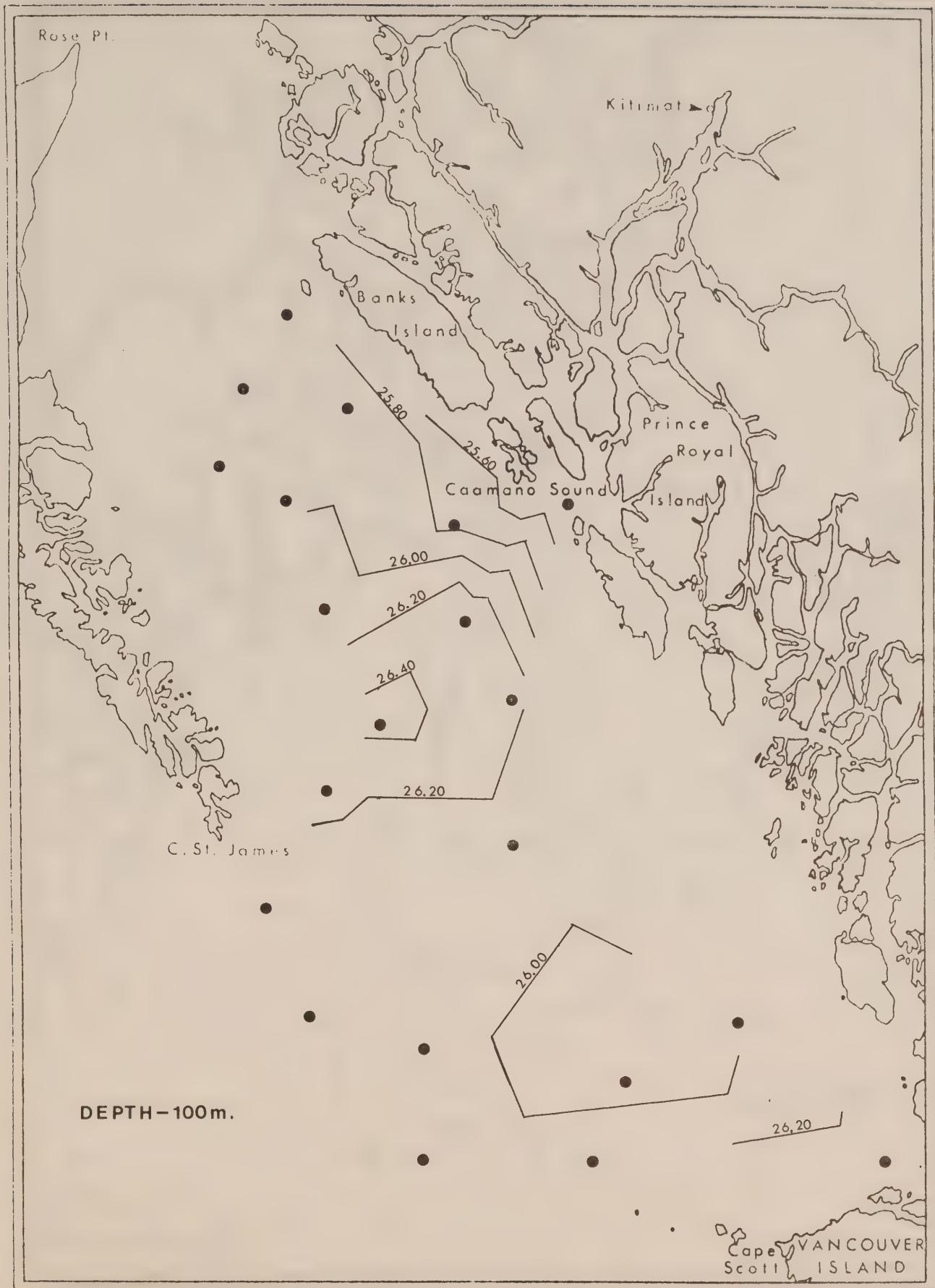


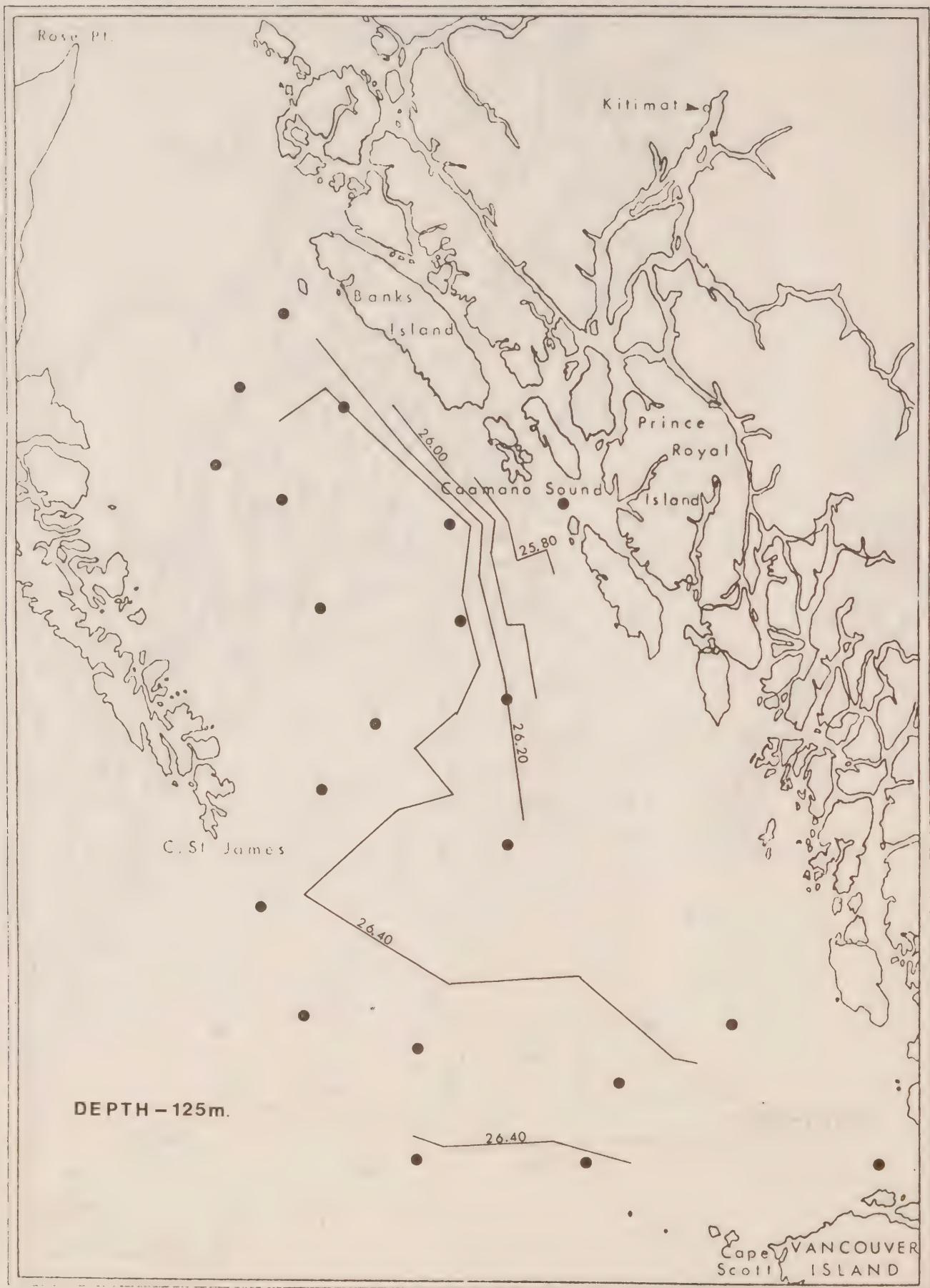
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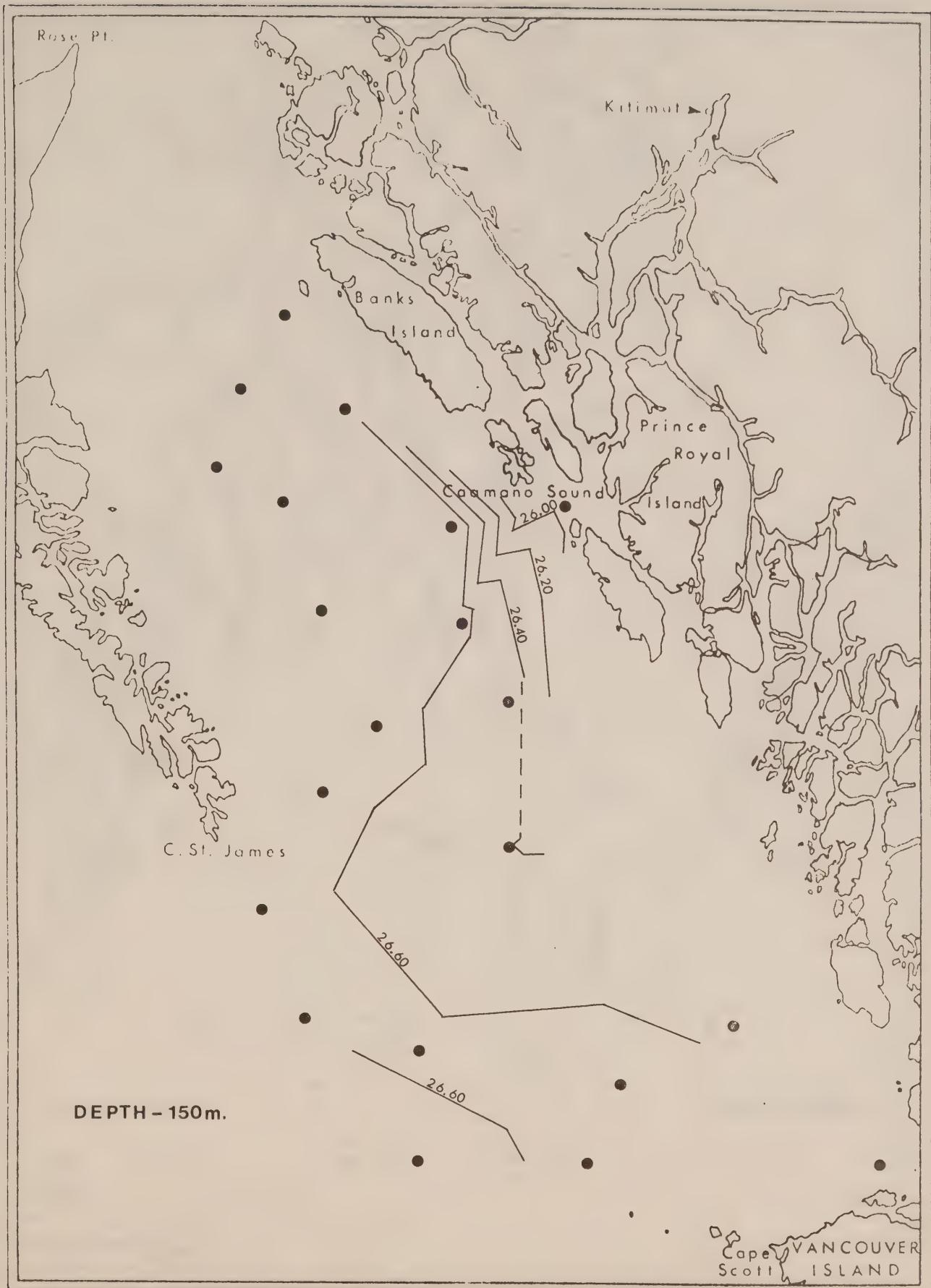


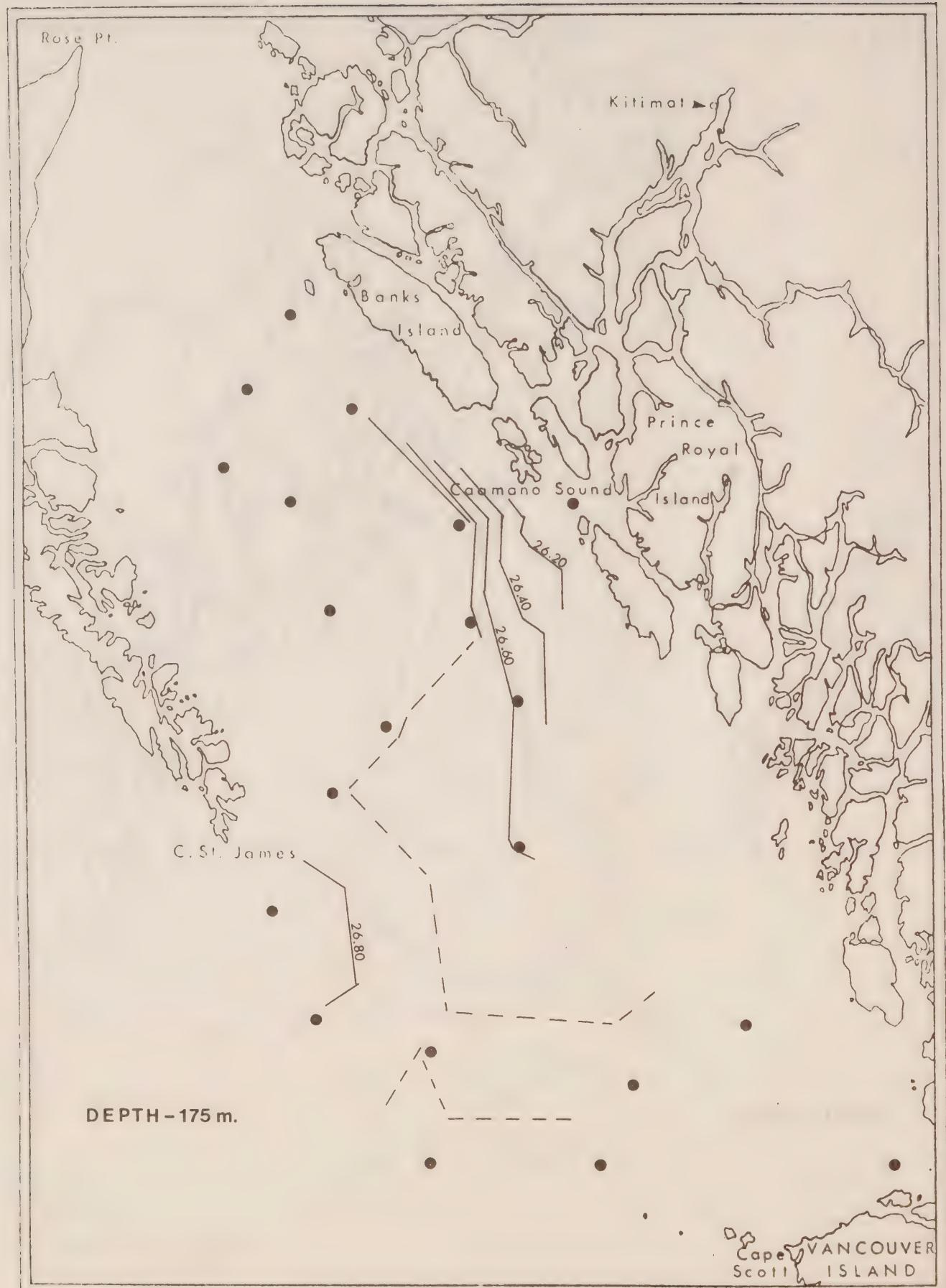


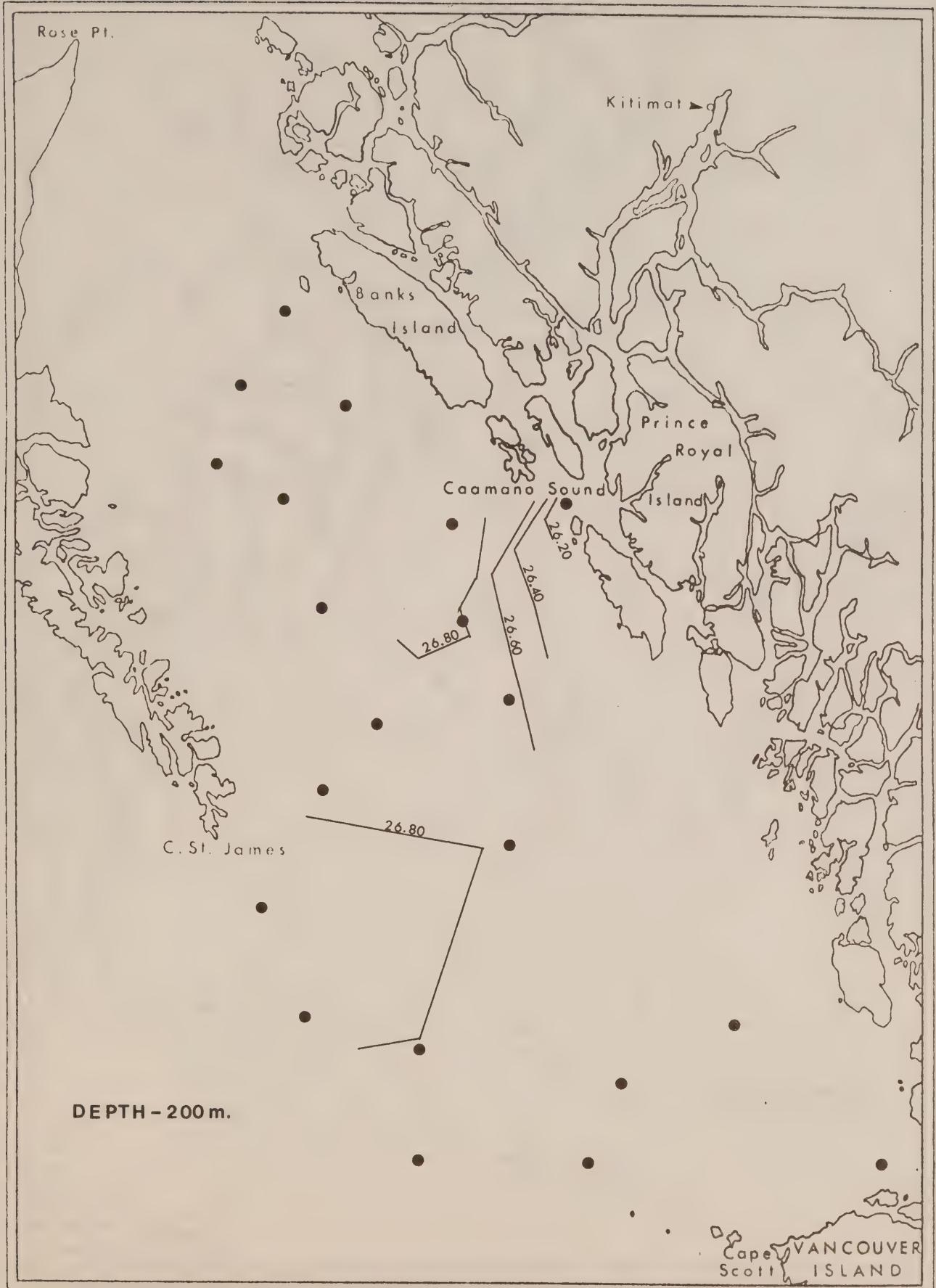


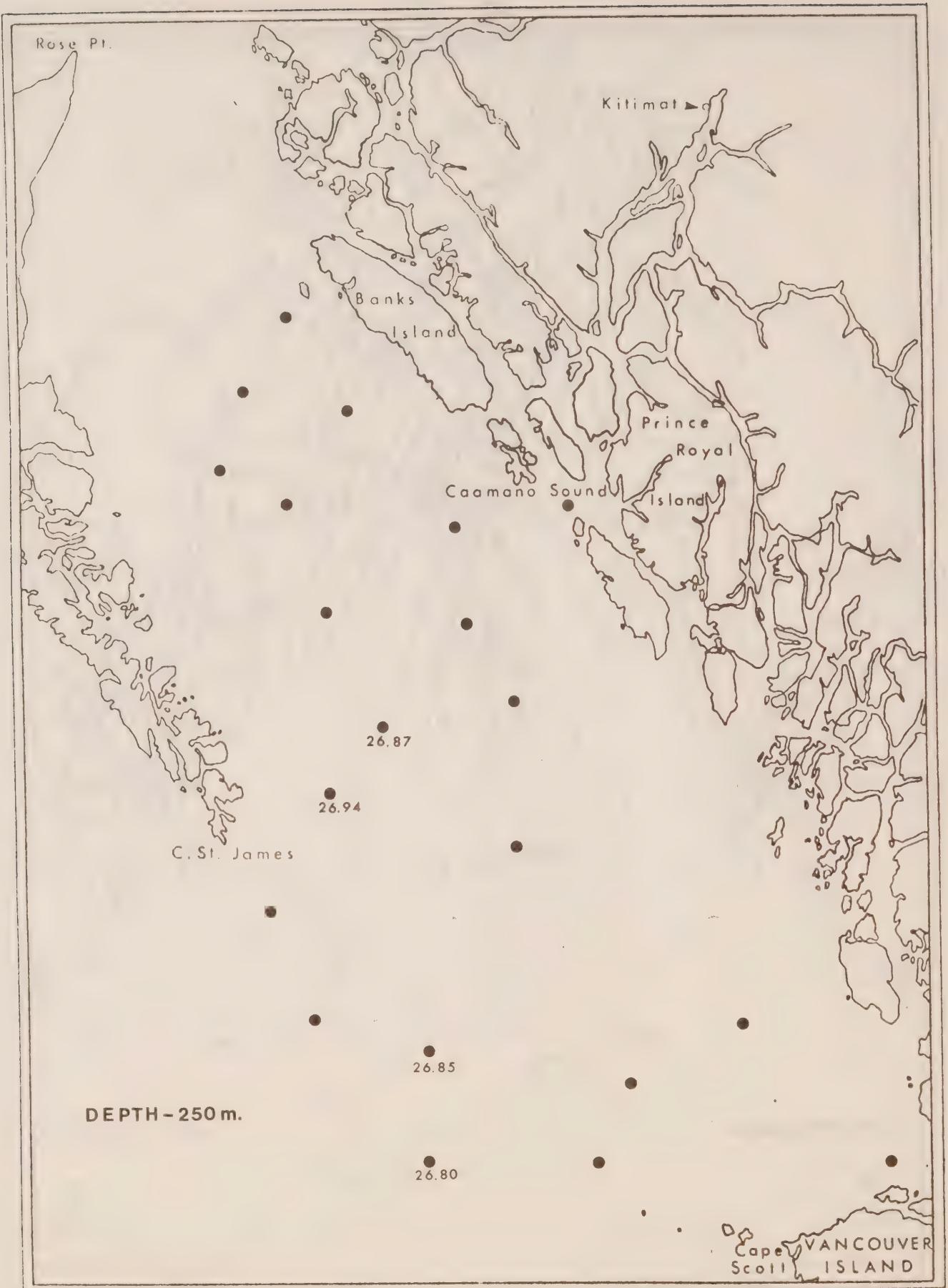


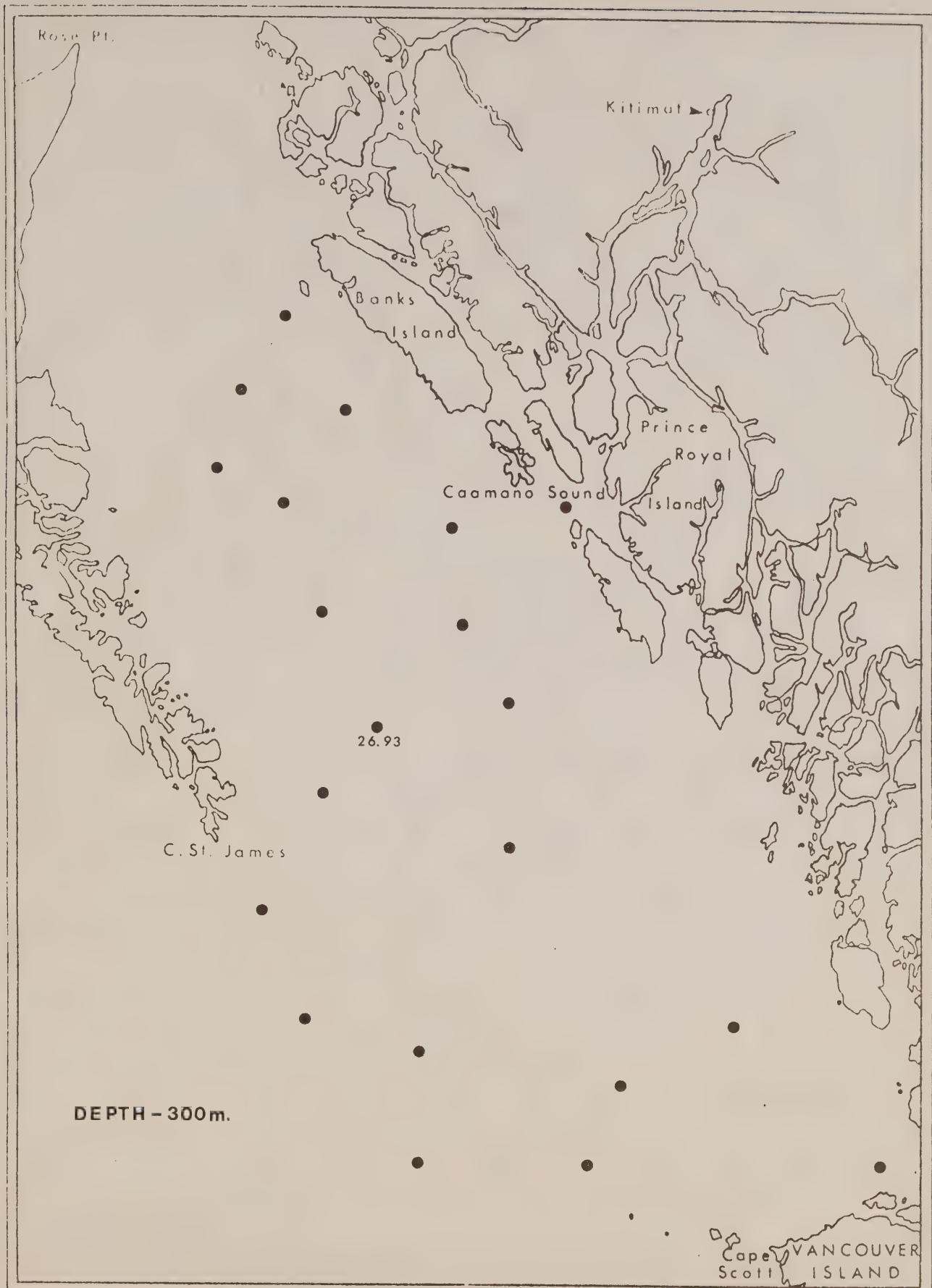






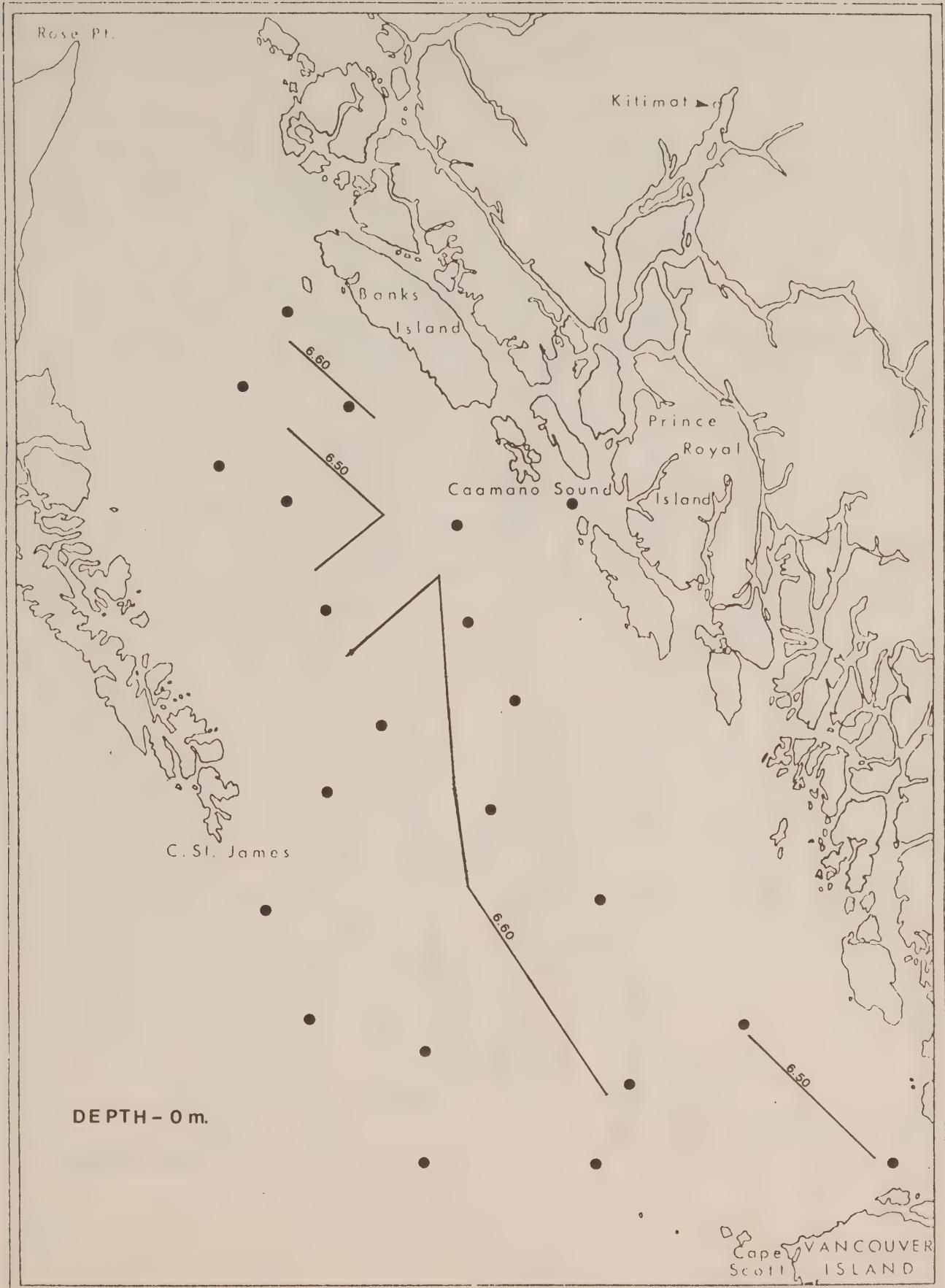


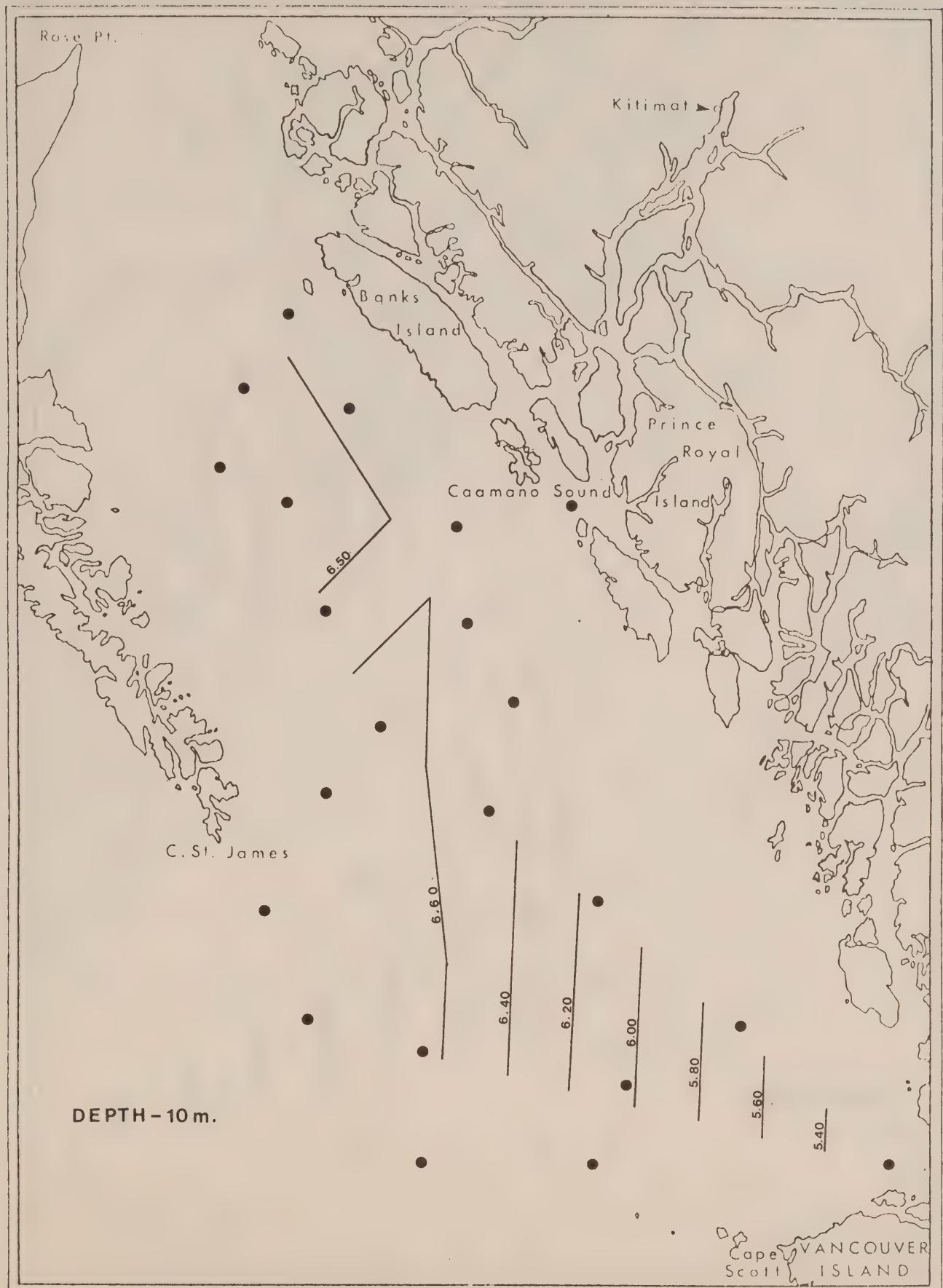


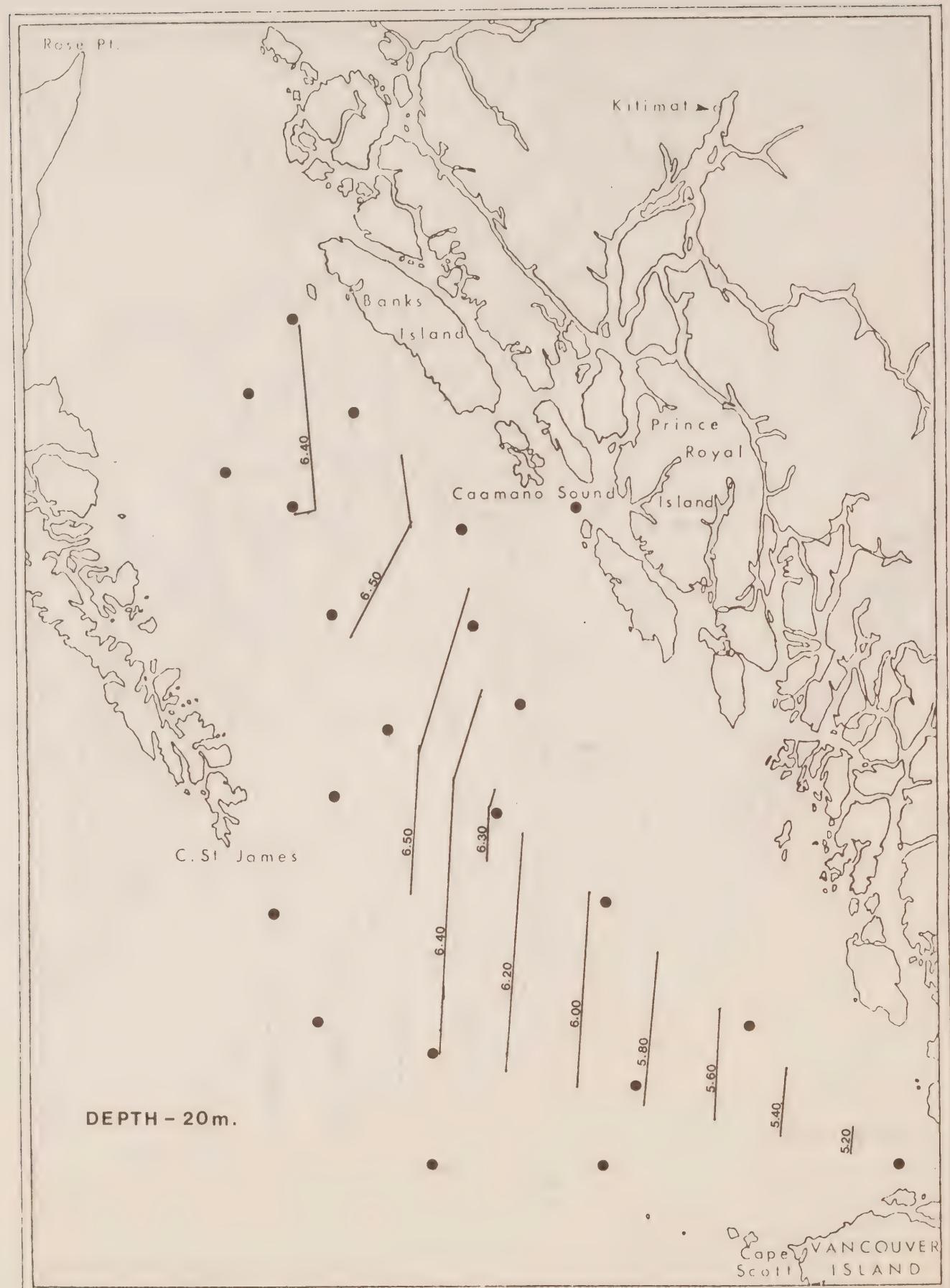


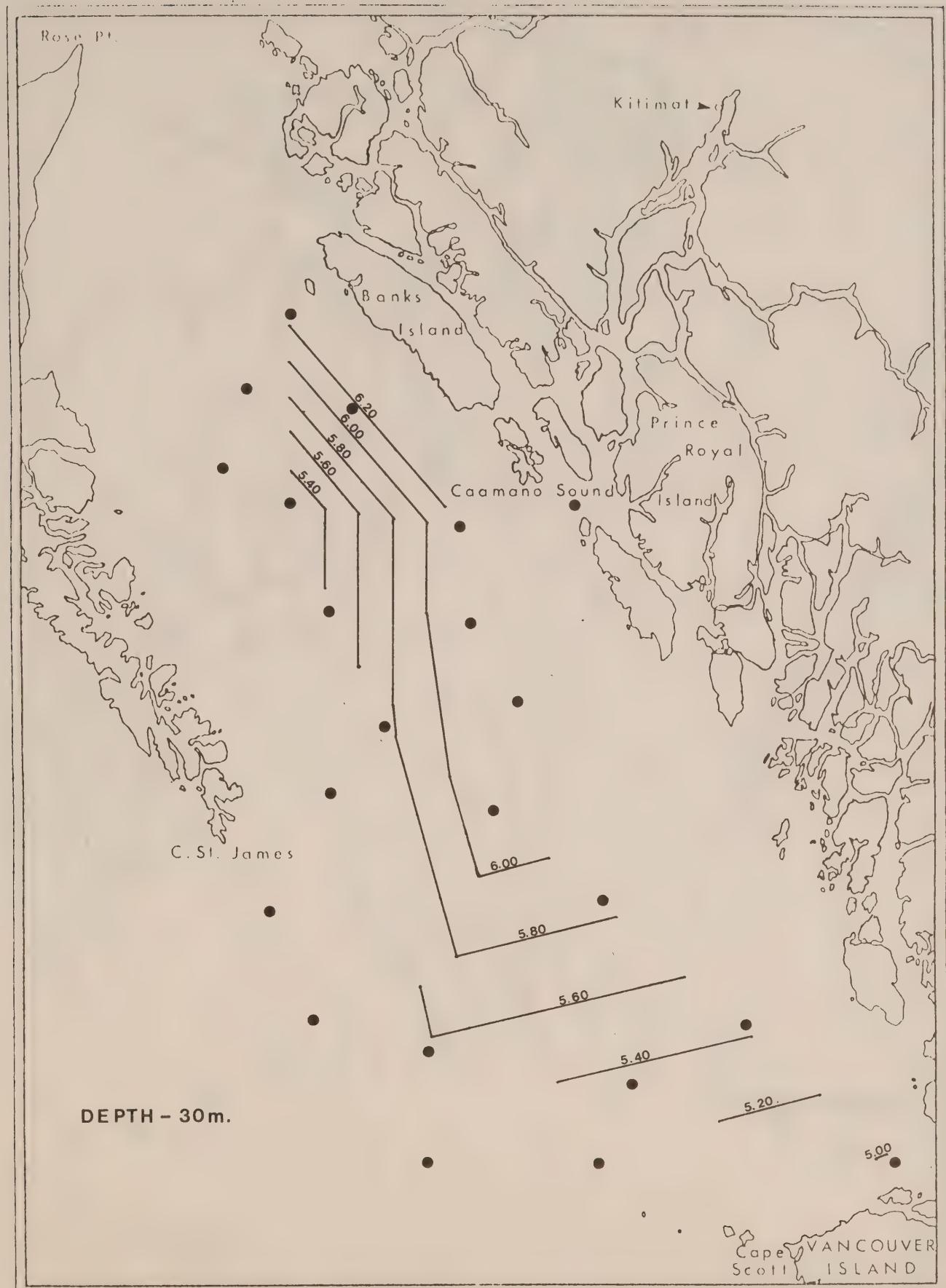


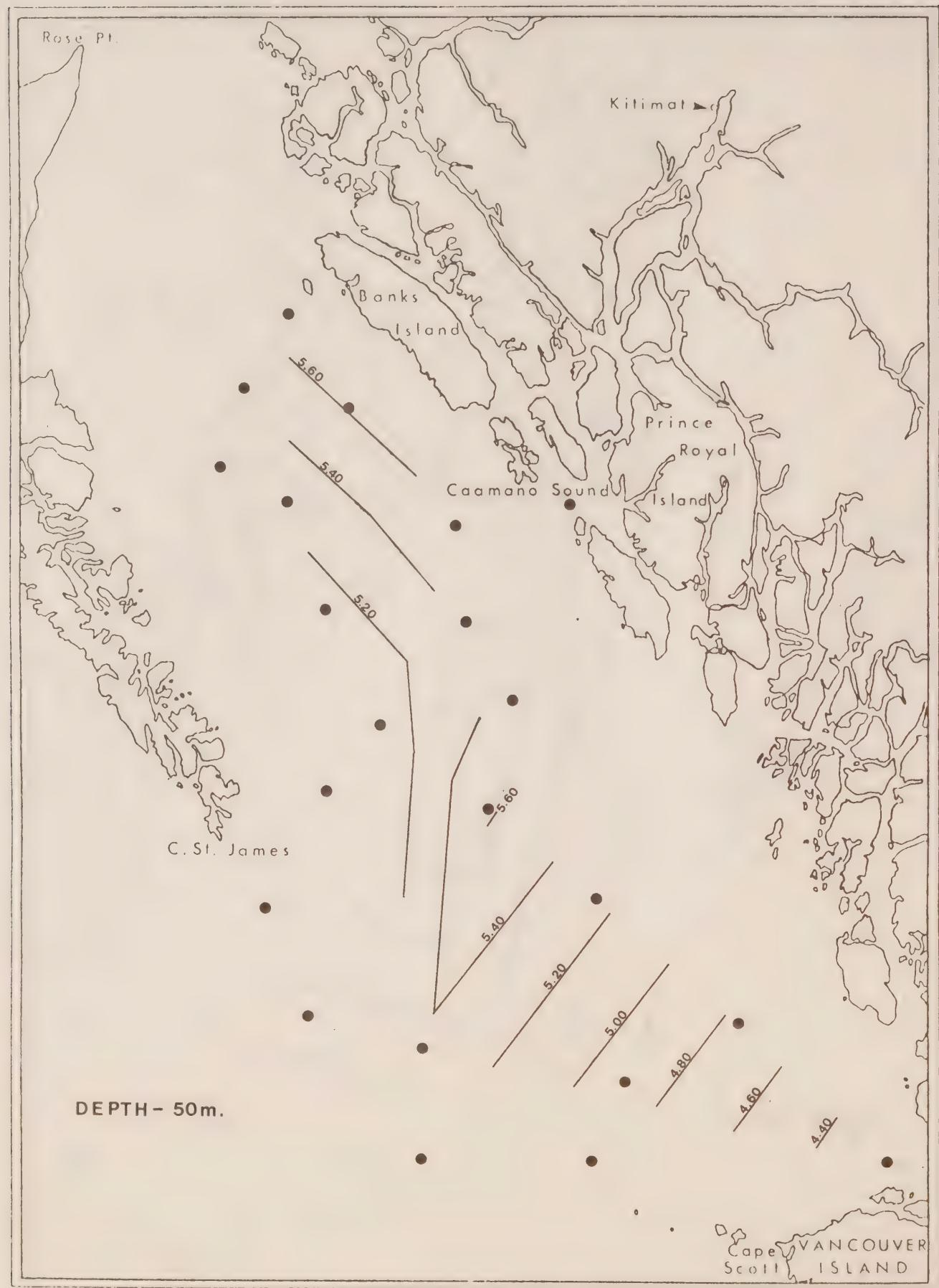
DISSOLVED OXYGEN
(mL/L)

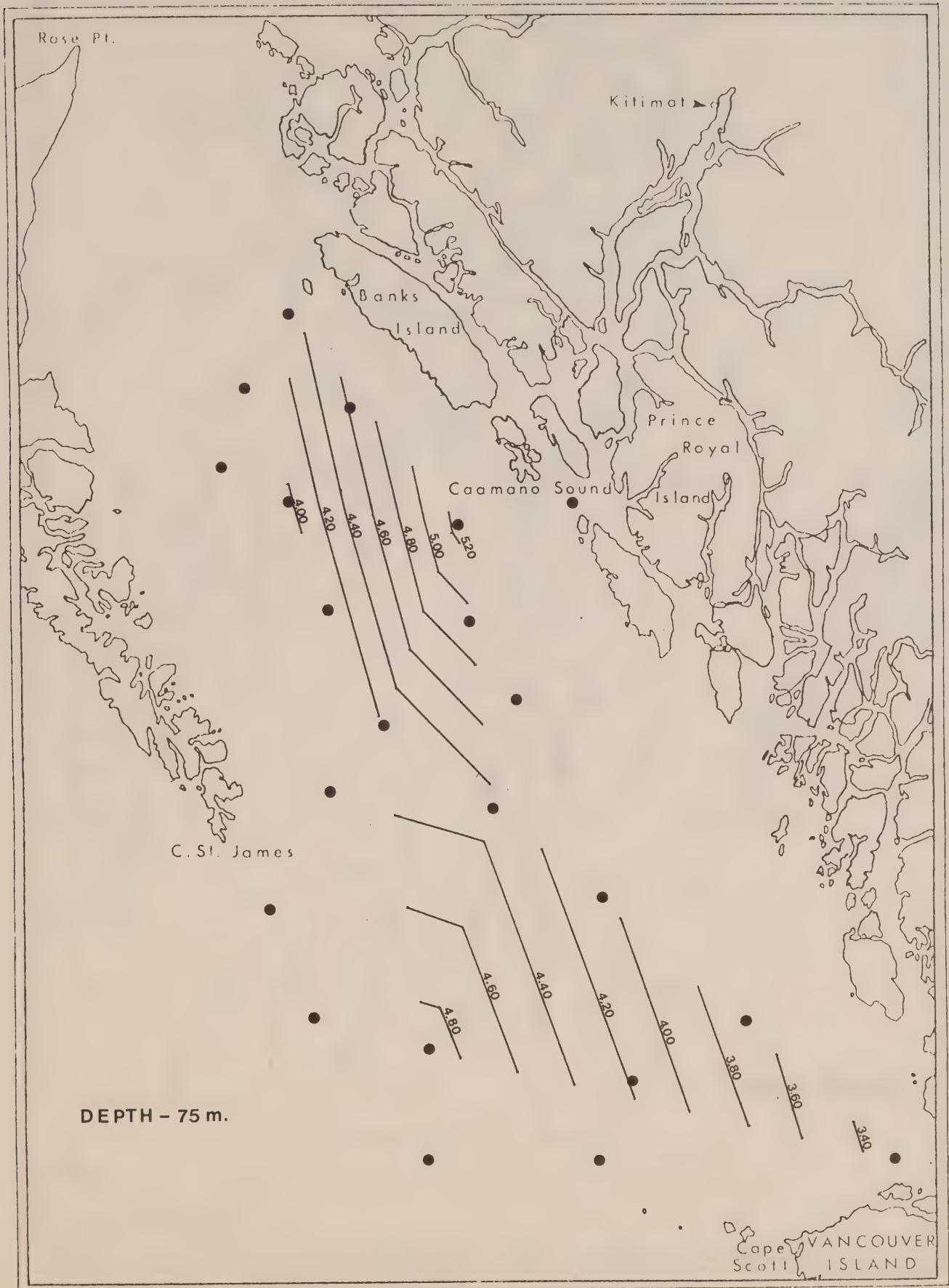


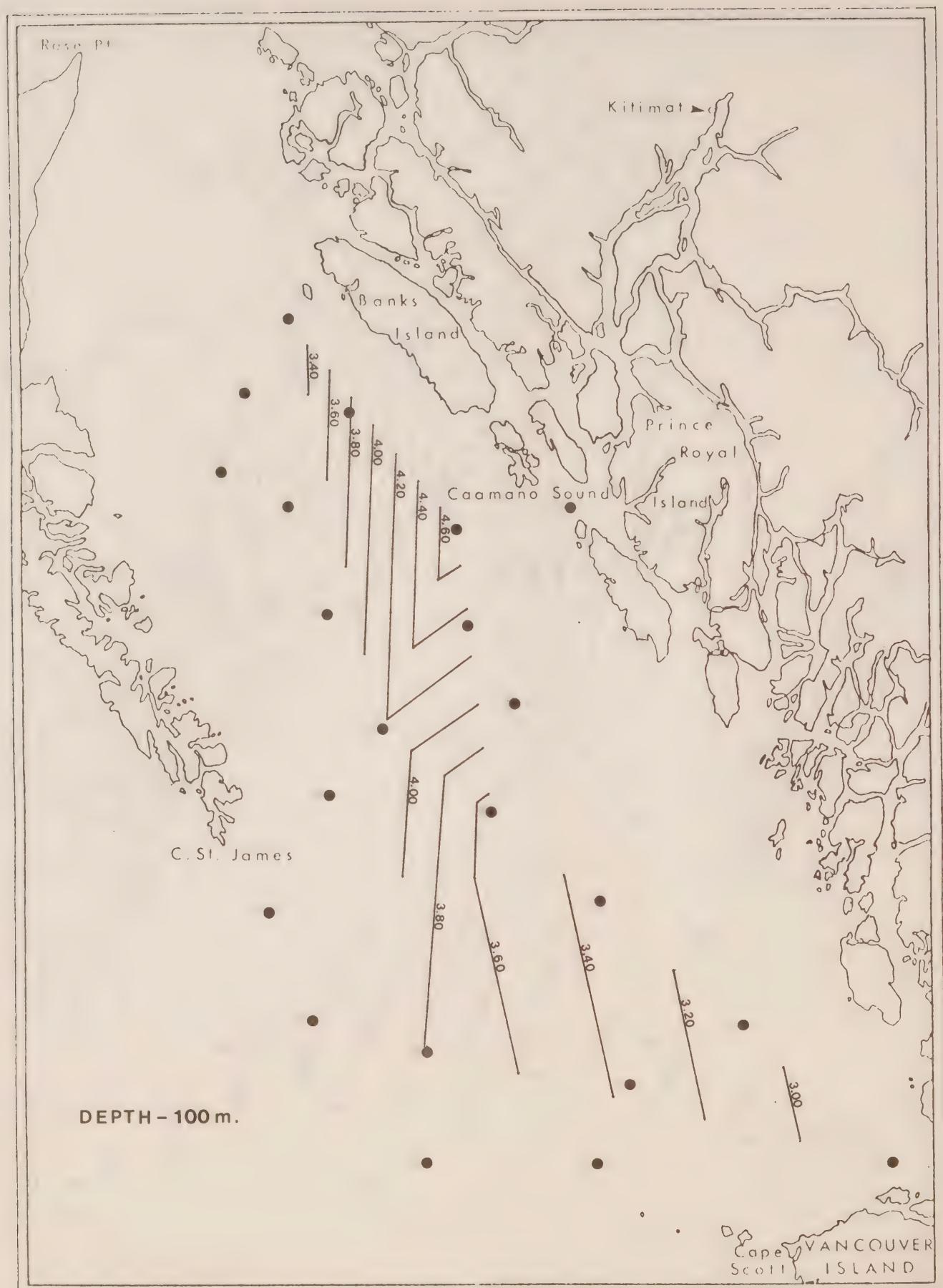


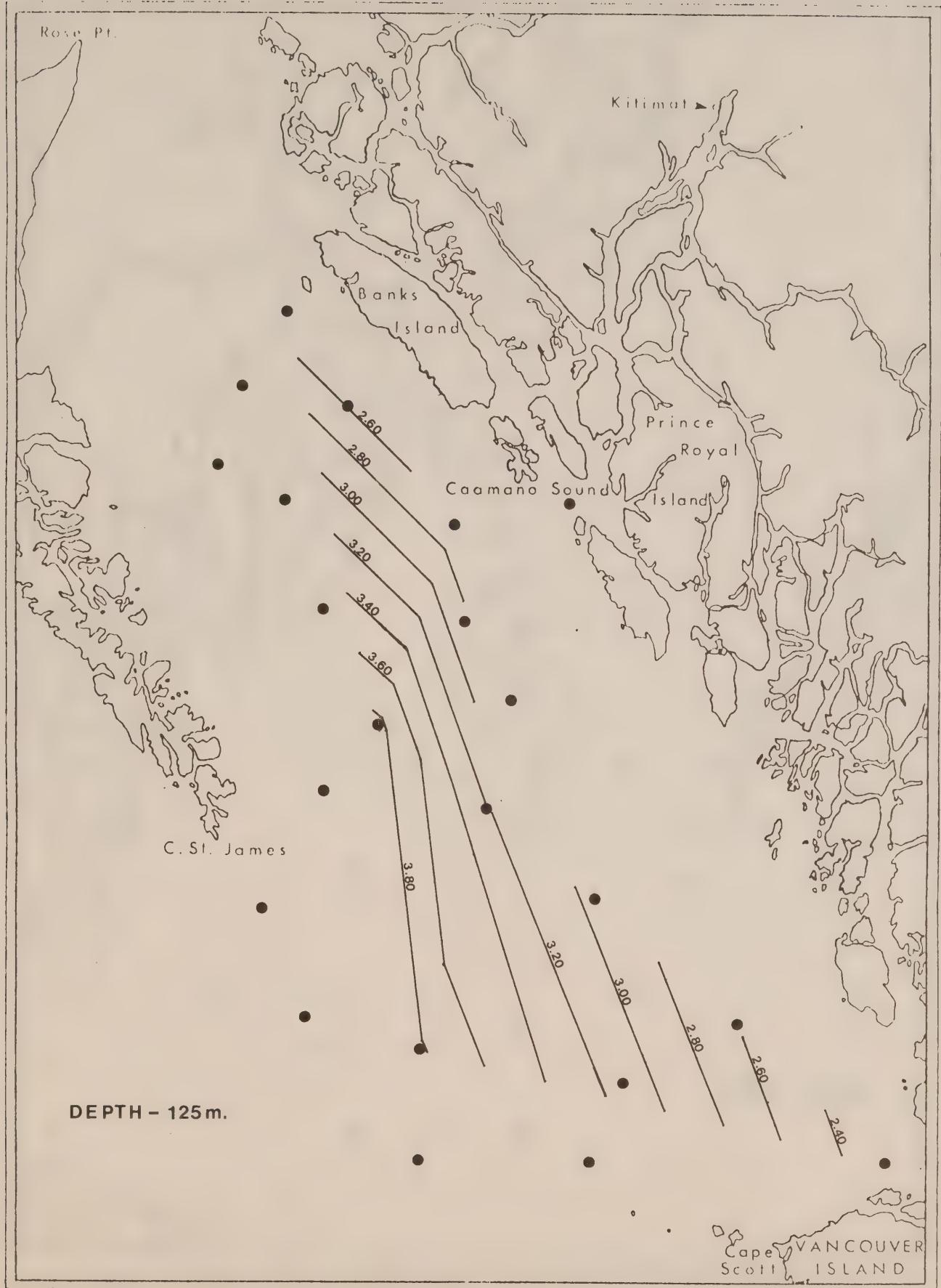


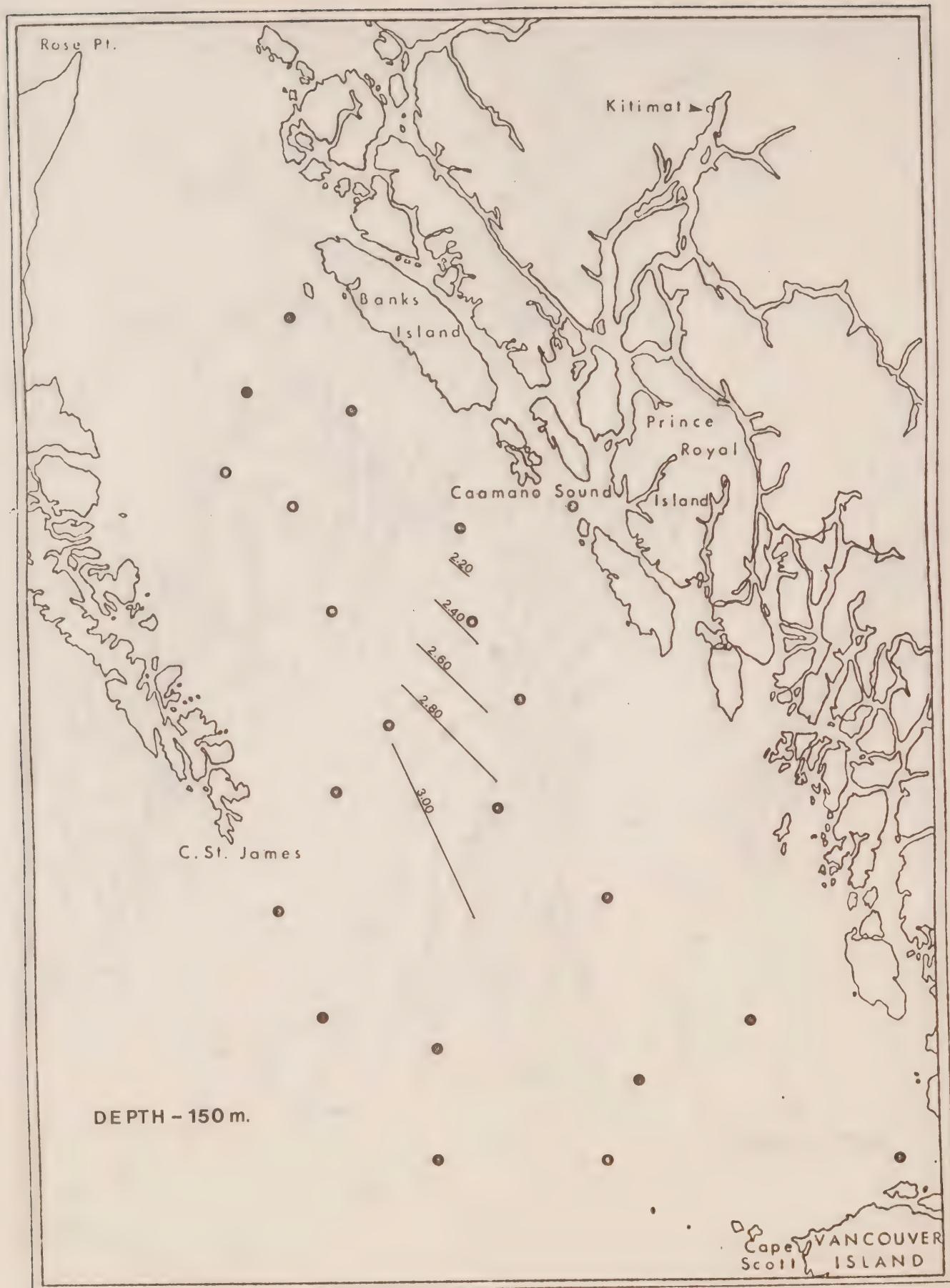


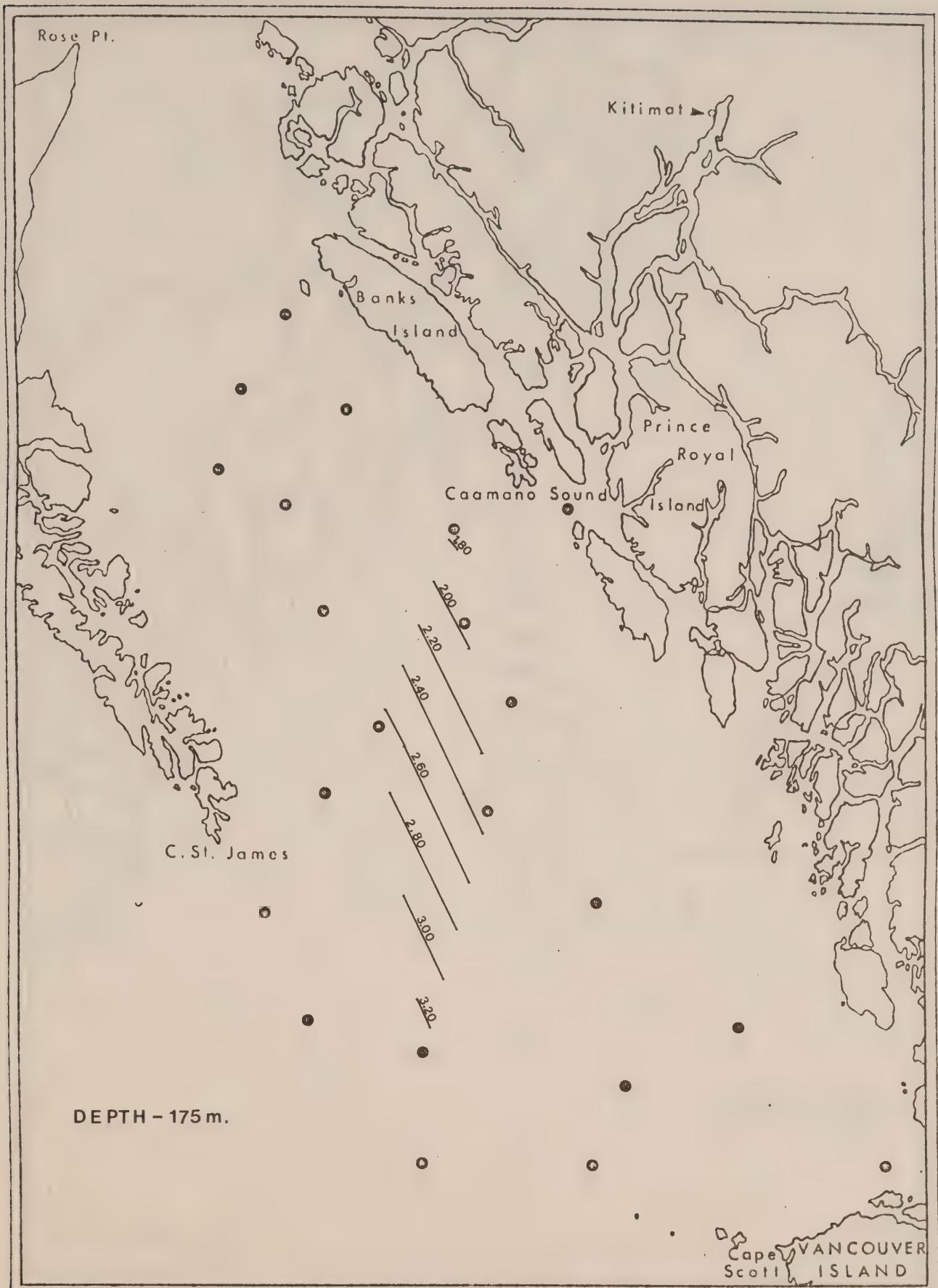


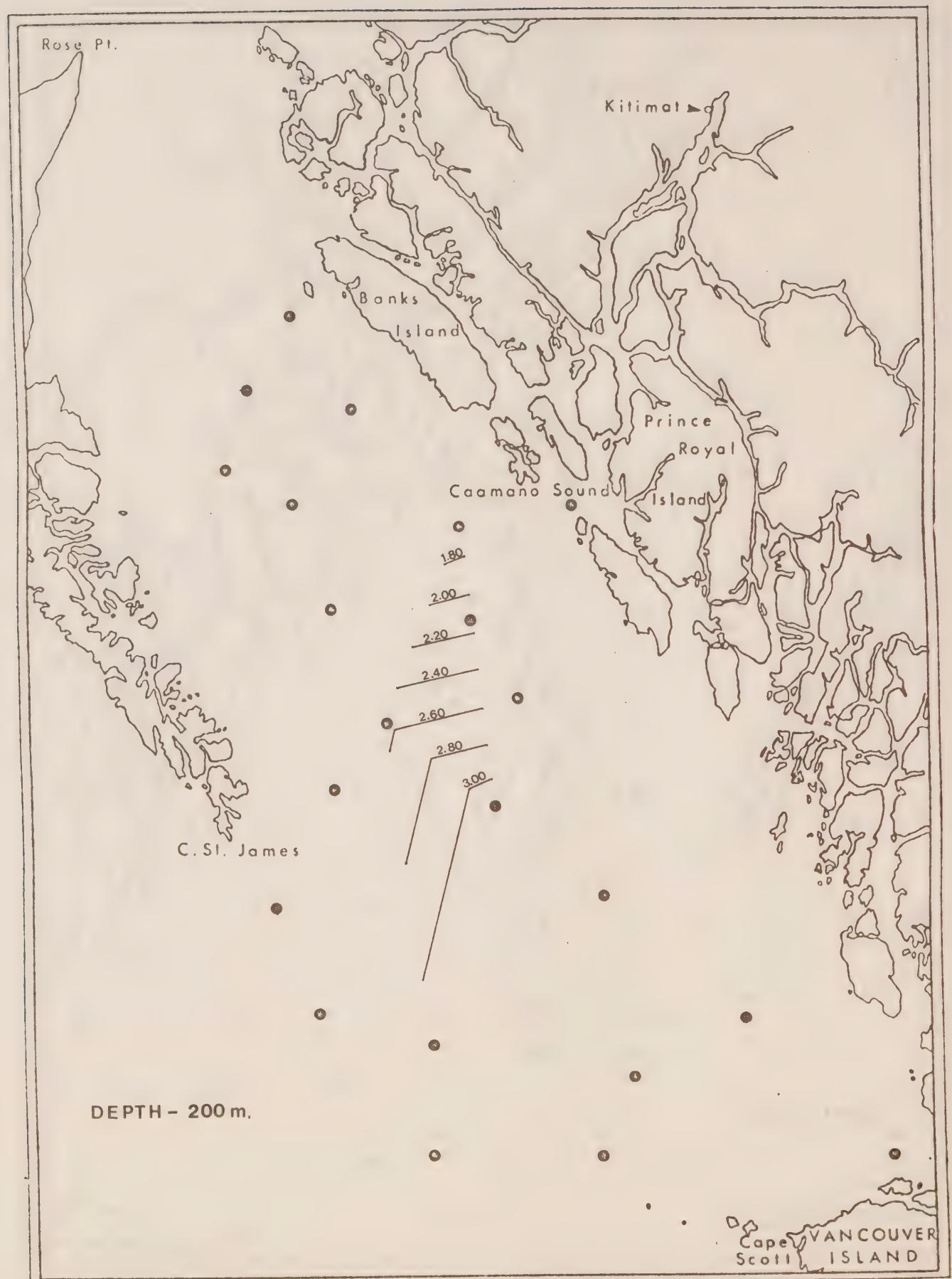


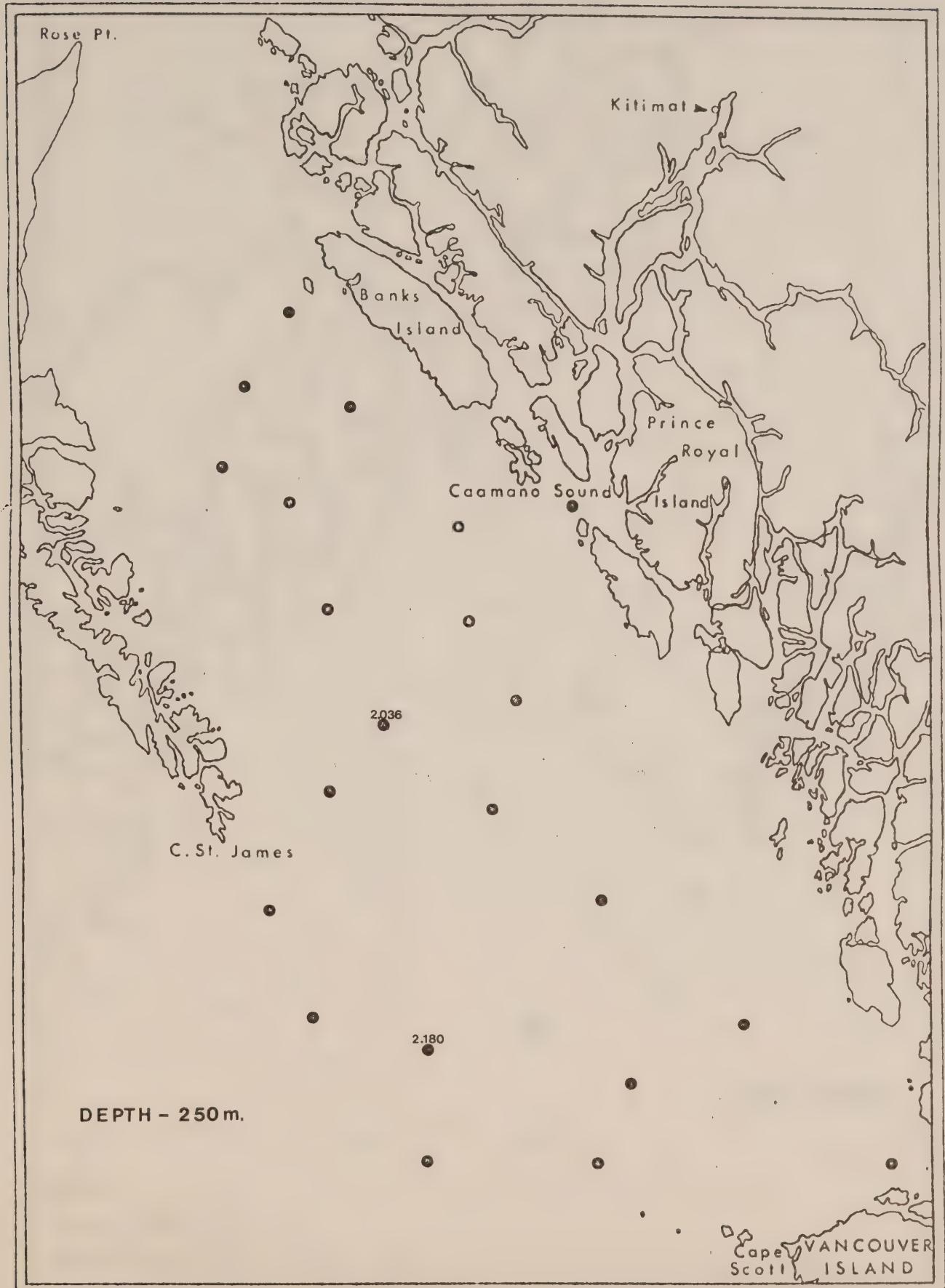


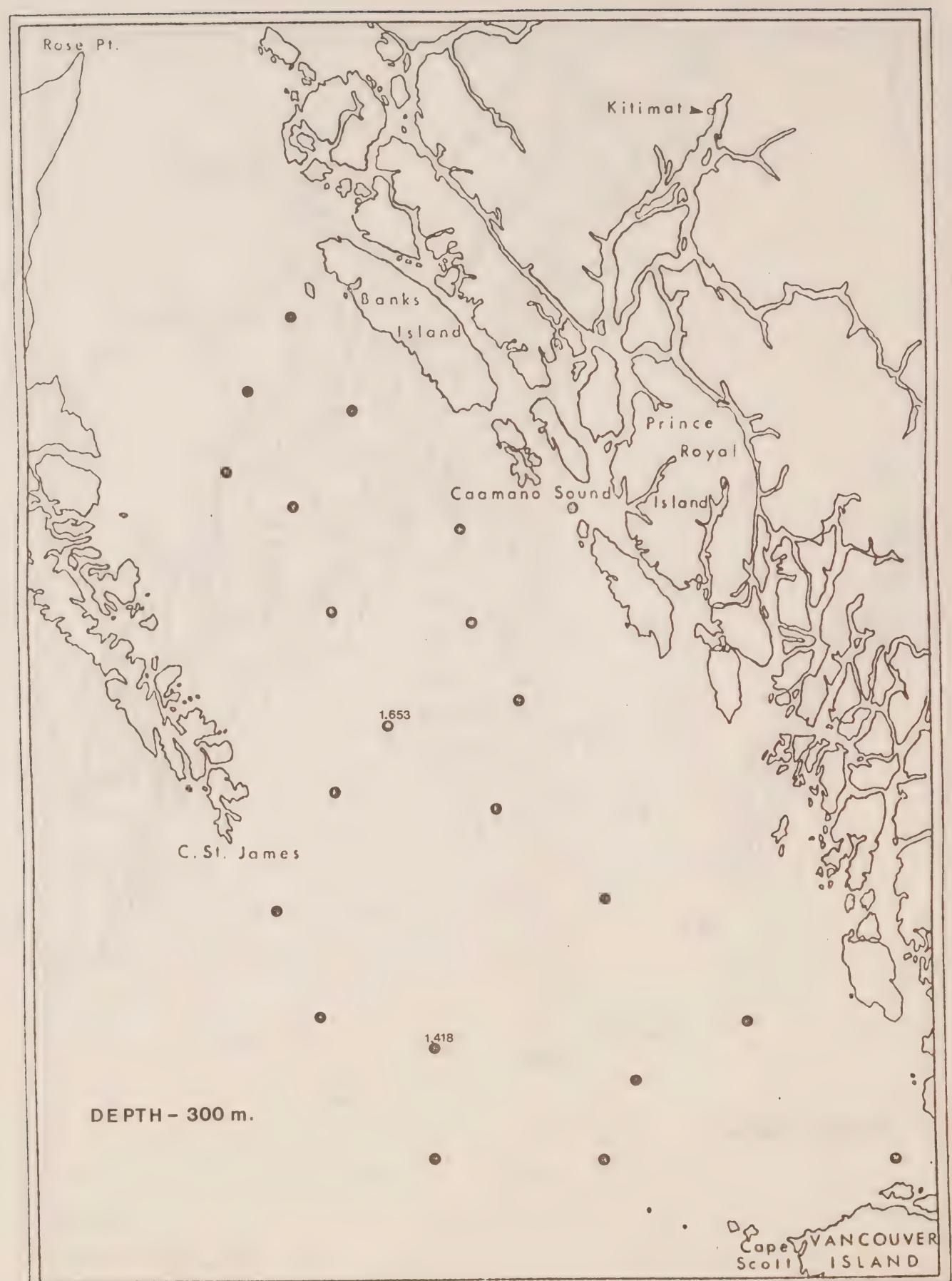


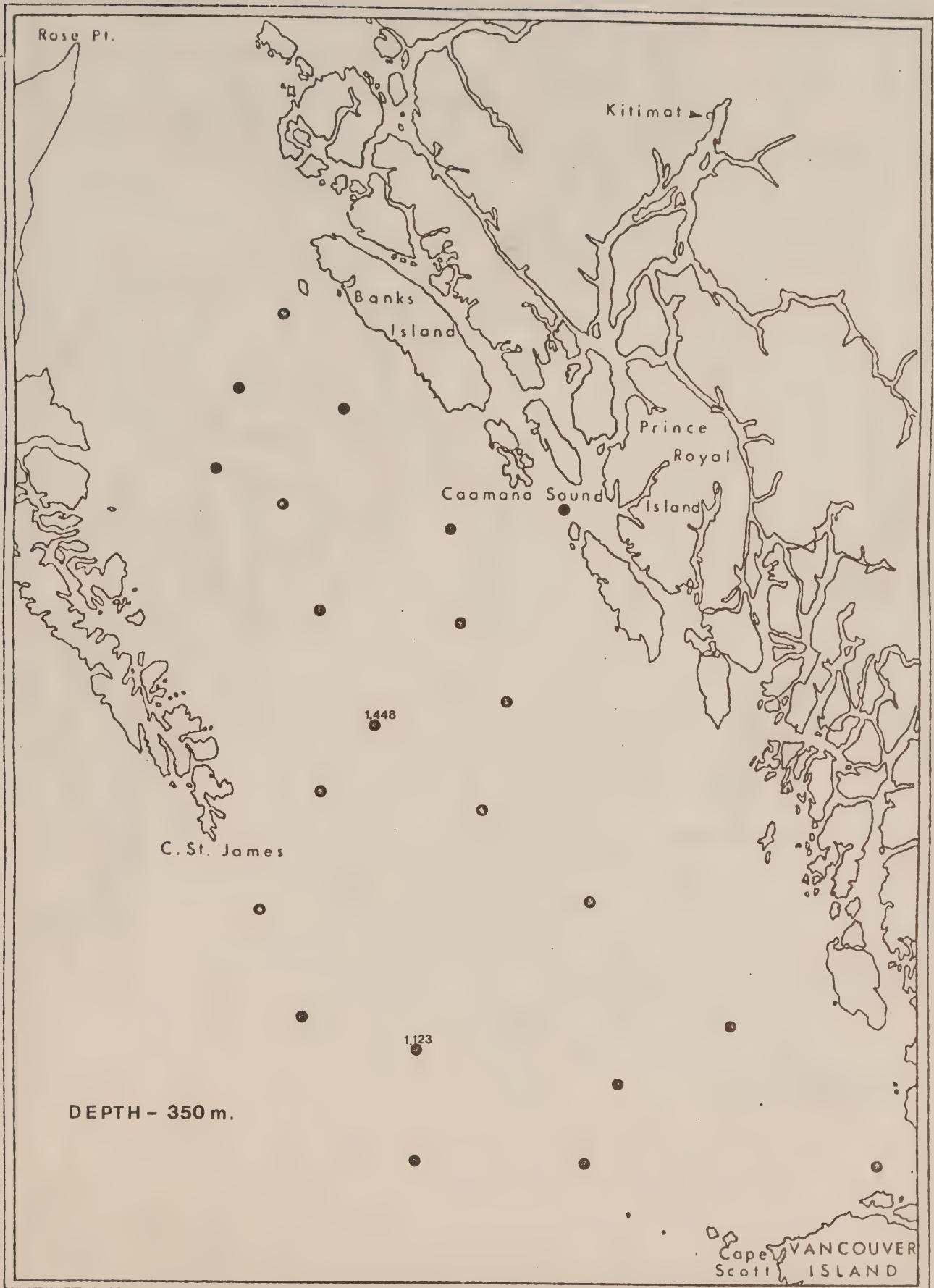


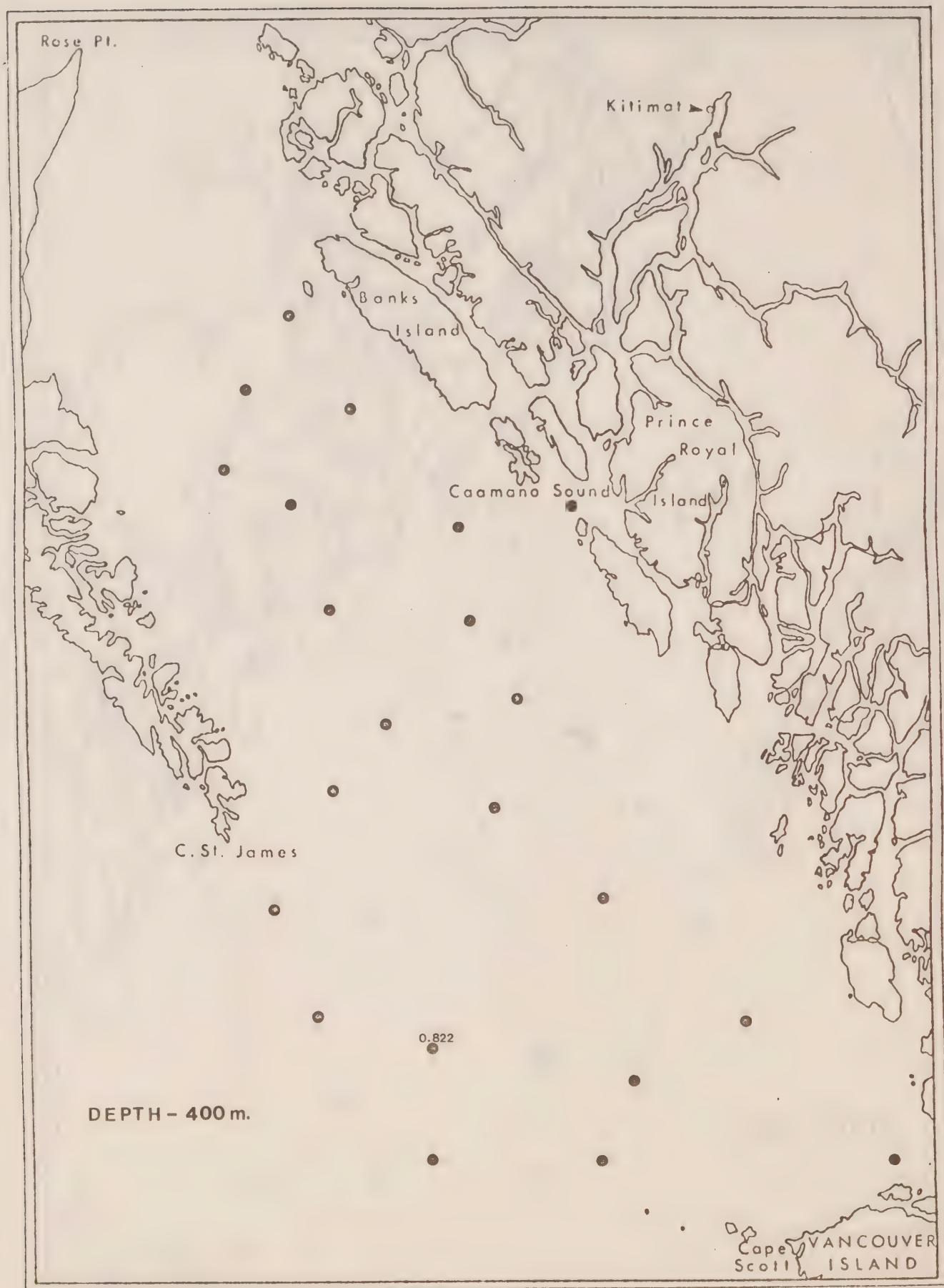










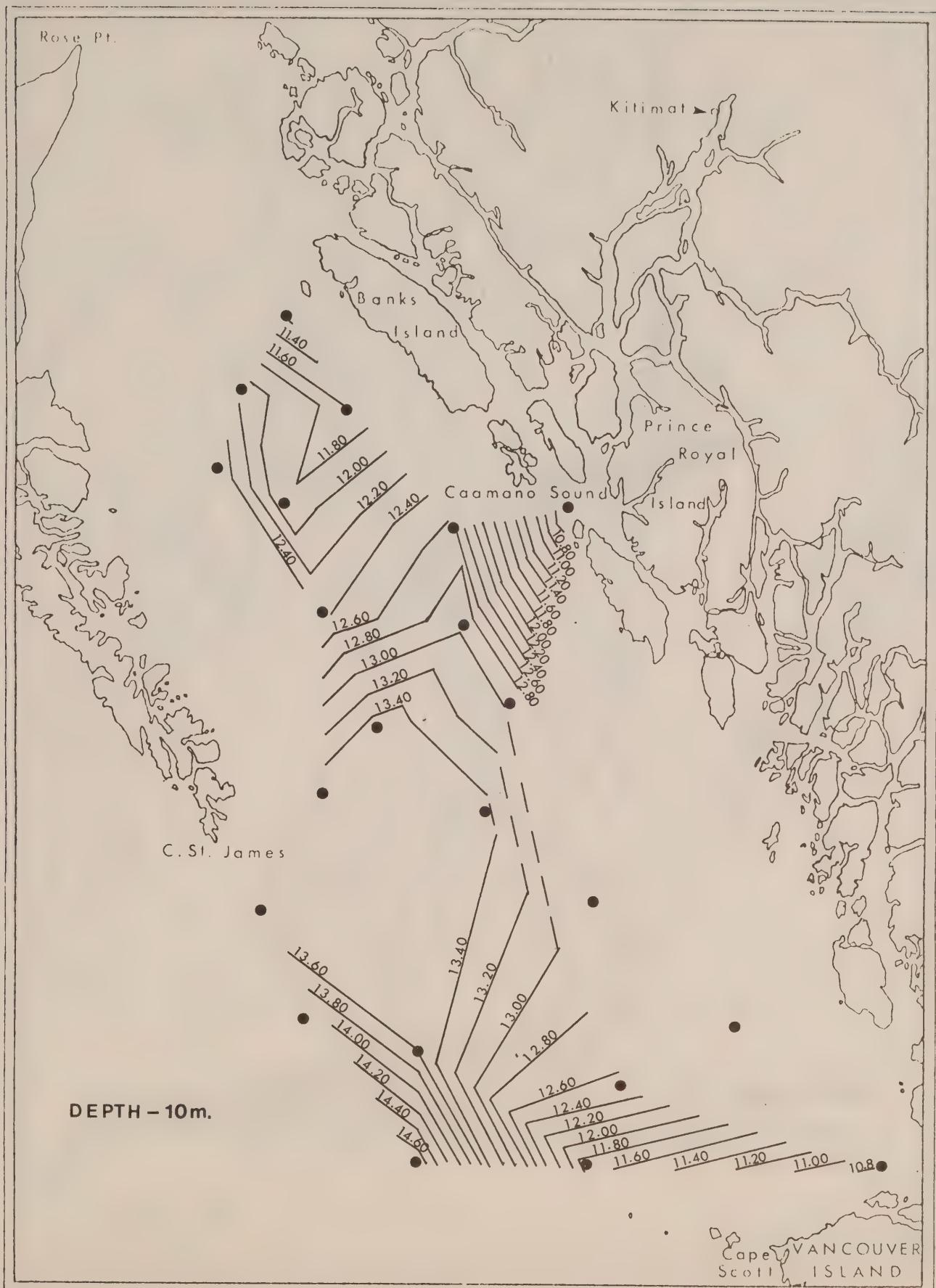


3.3 Cruise 77-14 (September 1977)

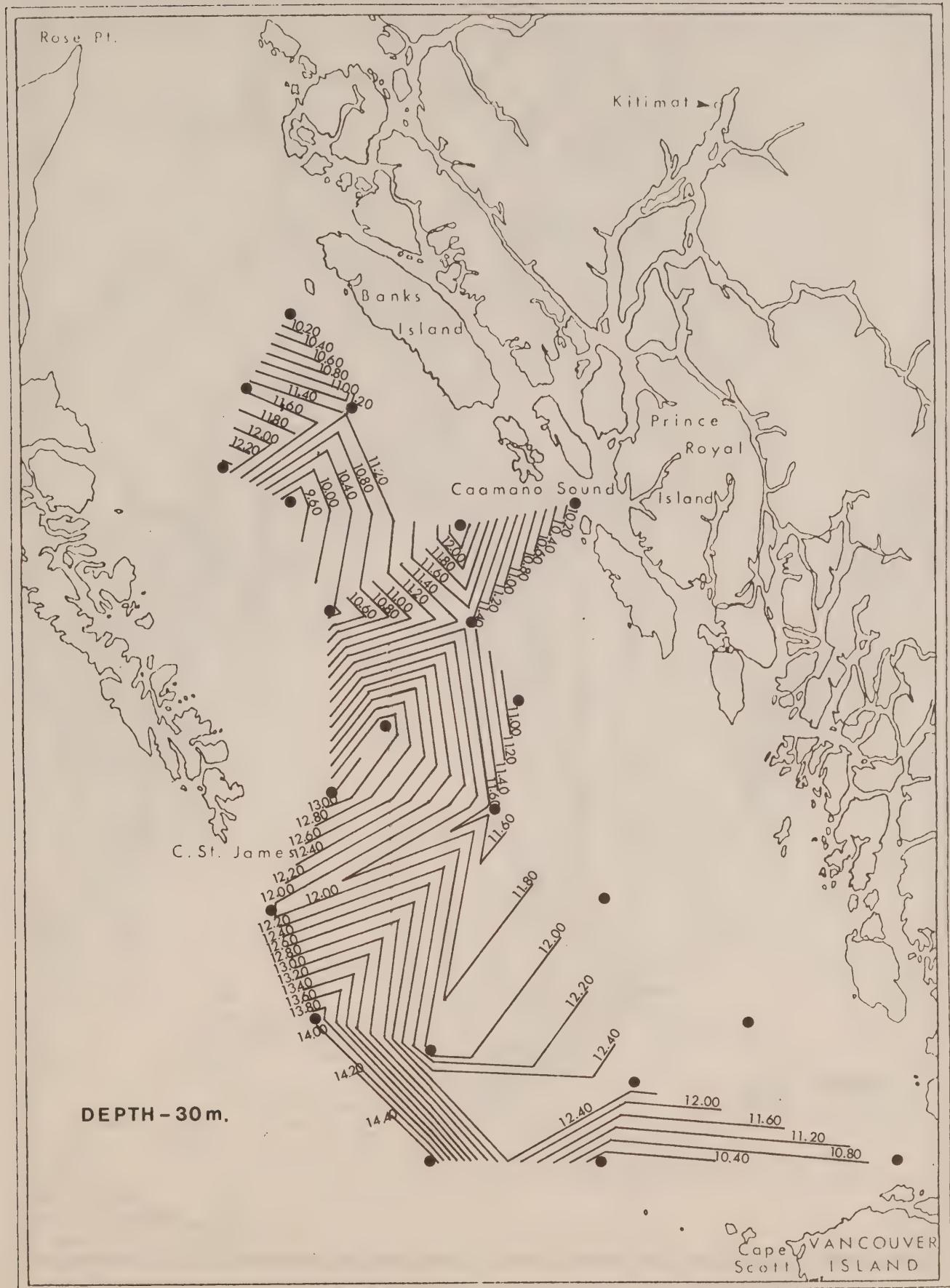
Horizontal sections of temperature, salinity, sigma-t and dissolved oxygen content.

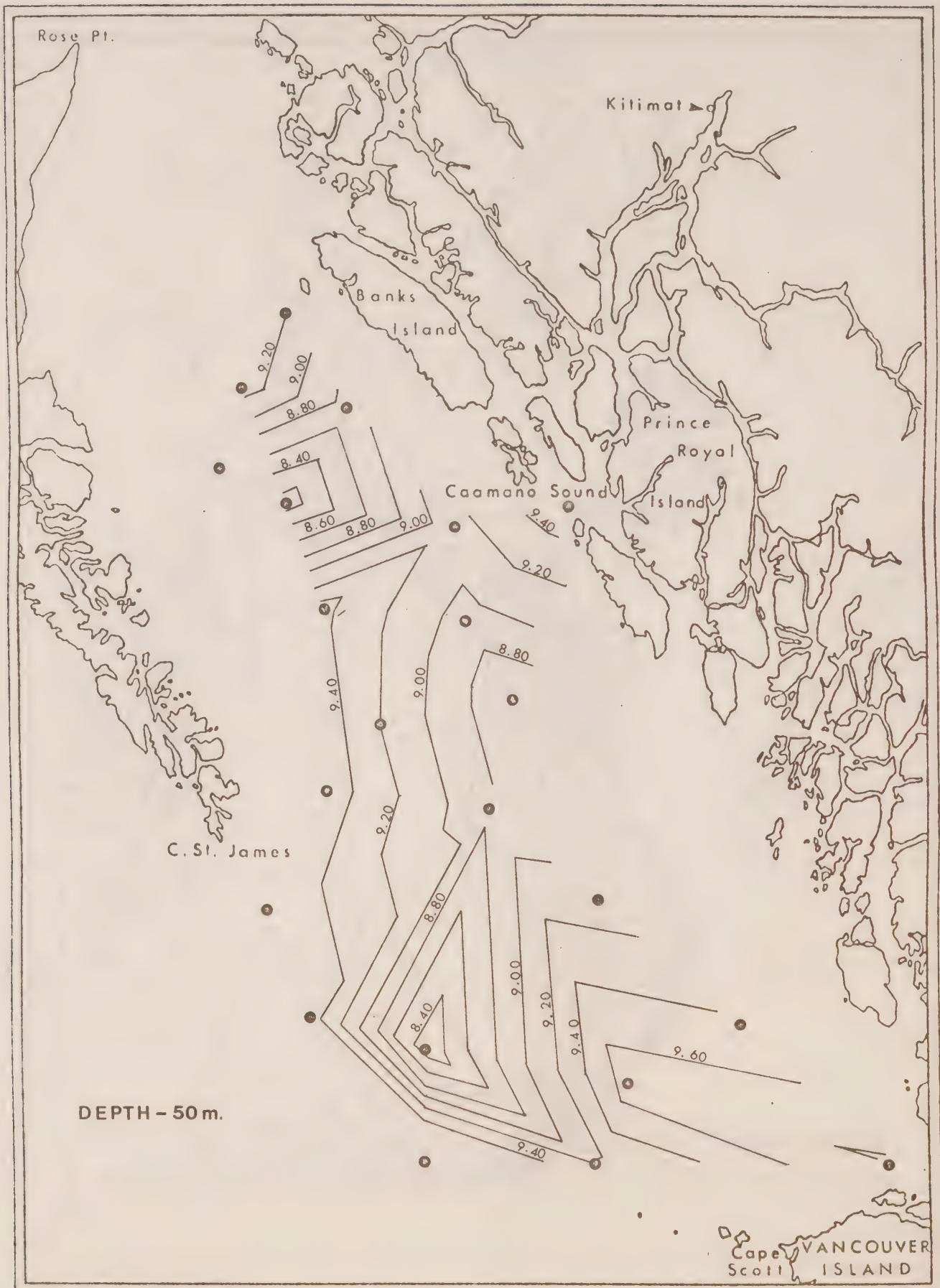
Units: temperature ($^{\circ}\text{C}$); salinity ($^{\circ}/\text{oo}$); dissolved oxygen (mL/L).

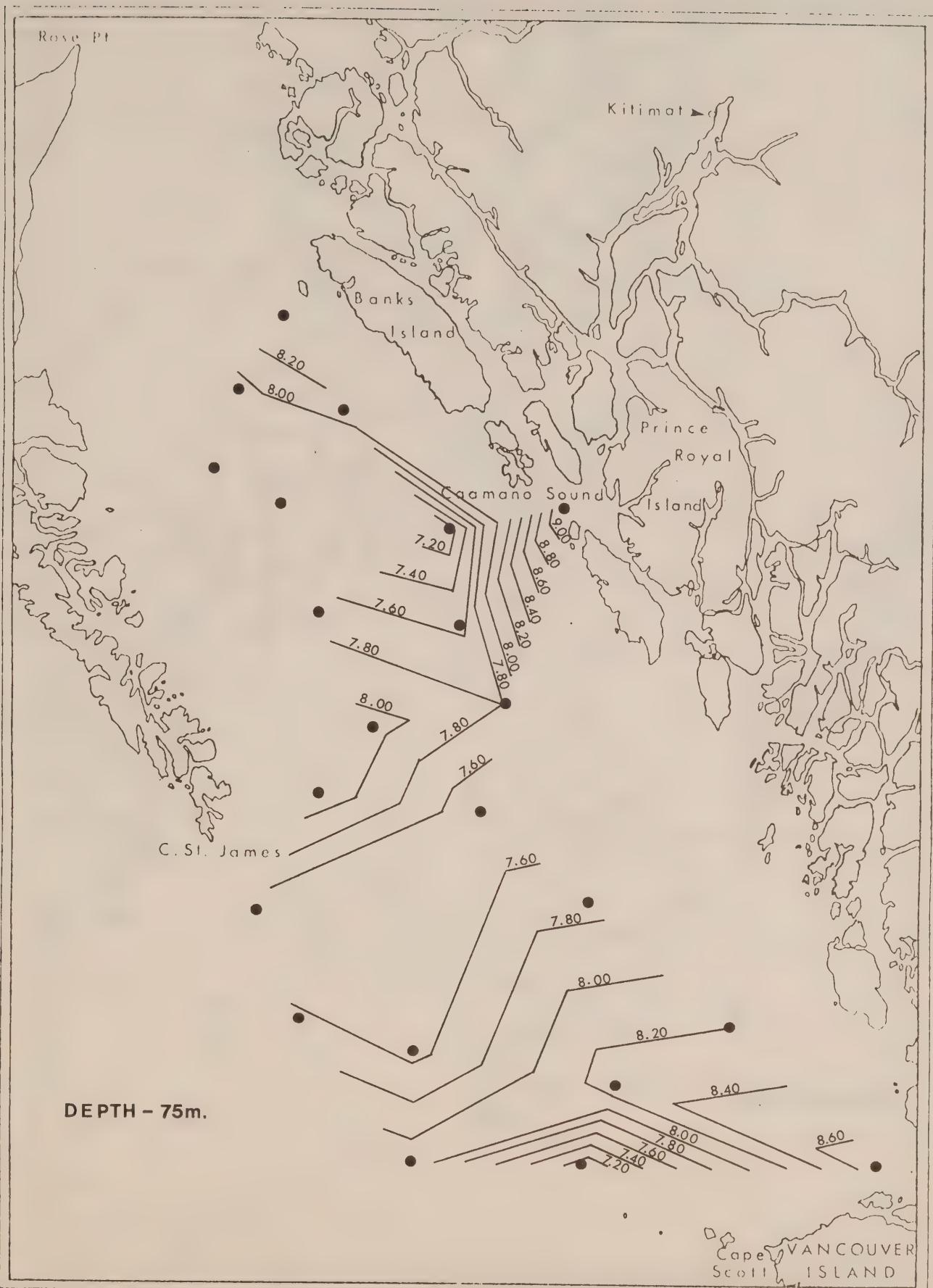
TEMPERATURE
(°C)



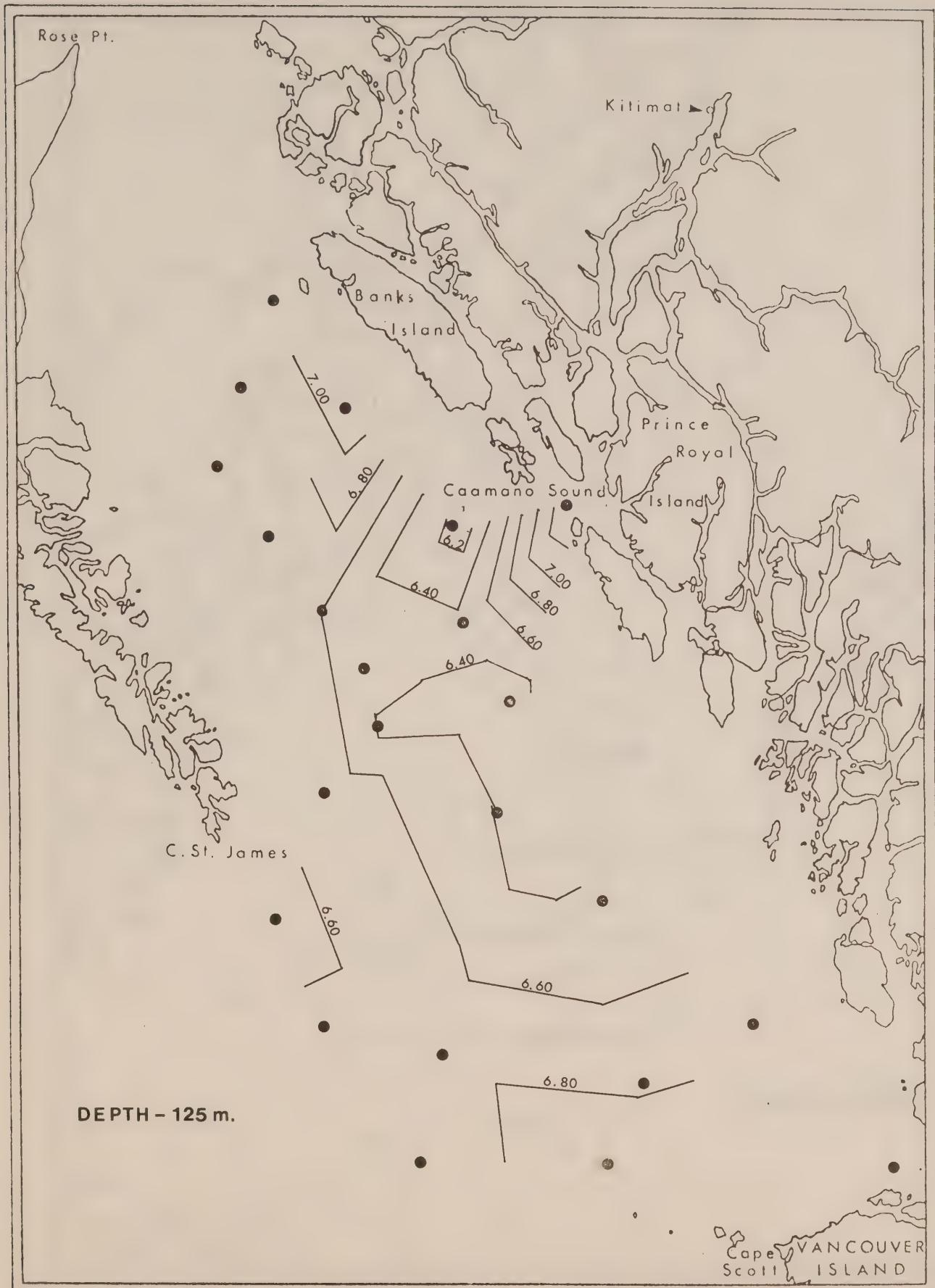


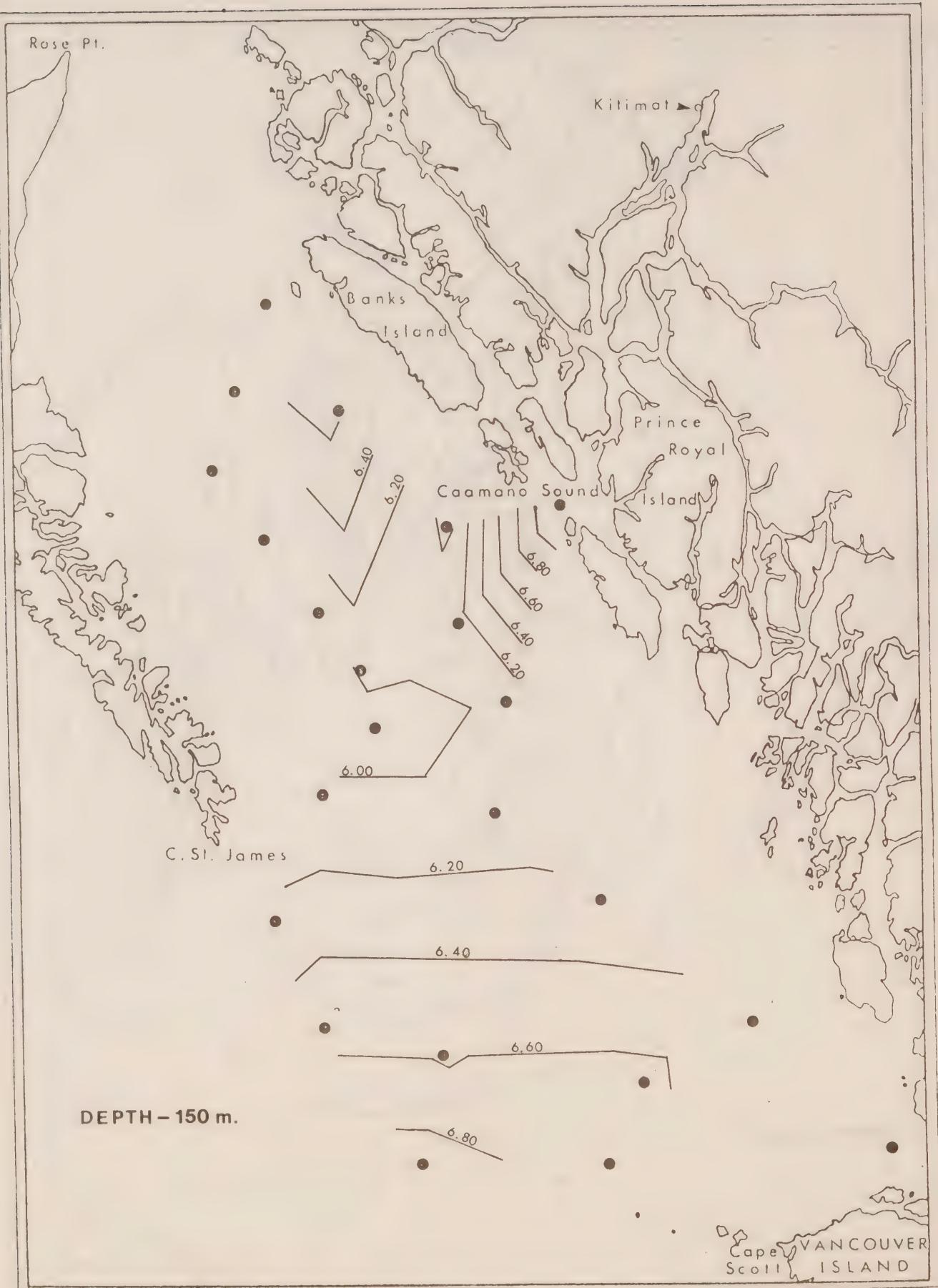


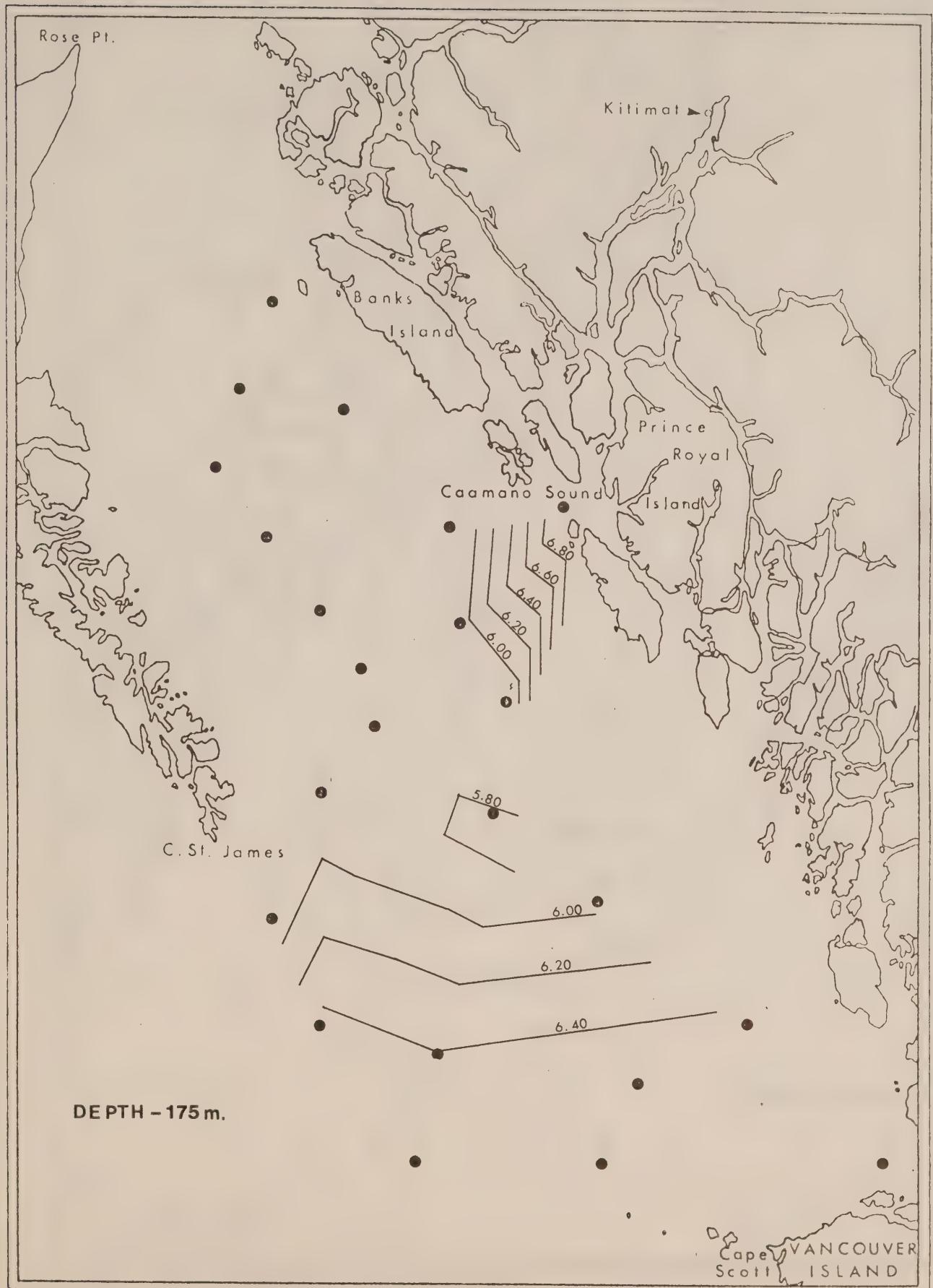


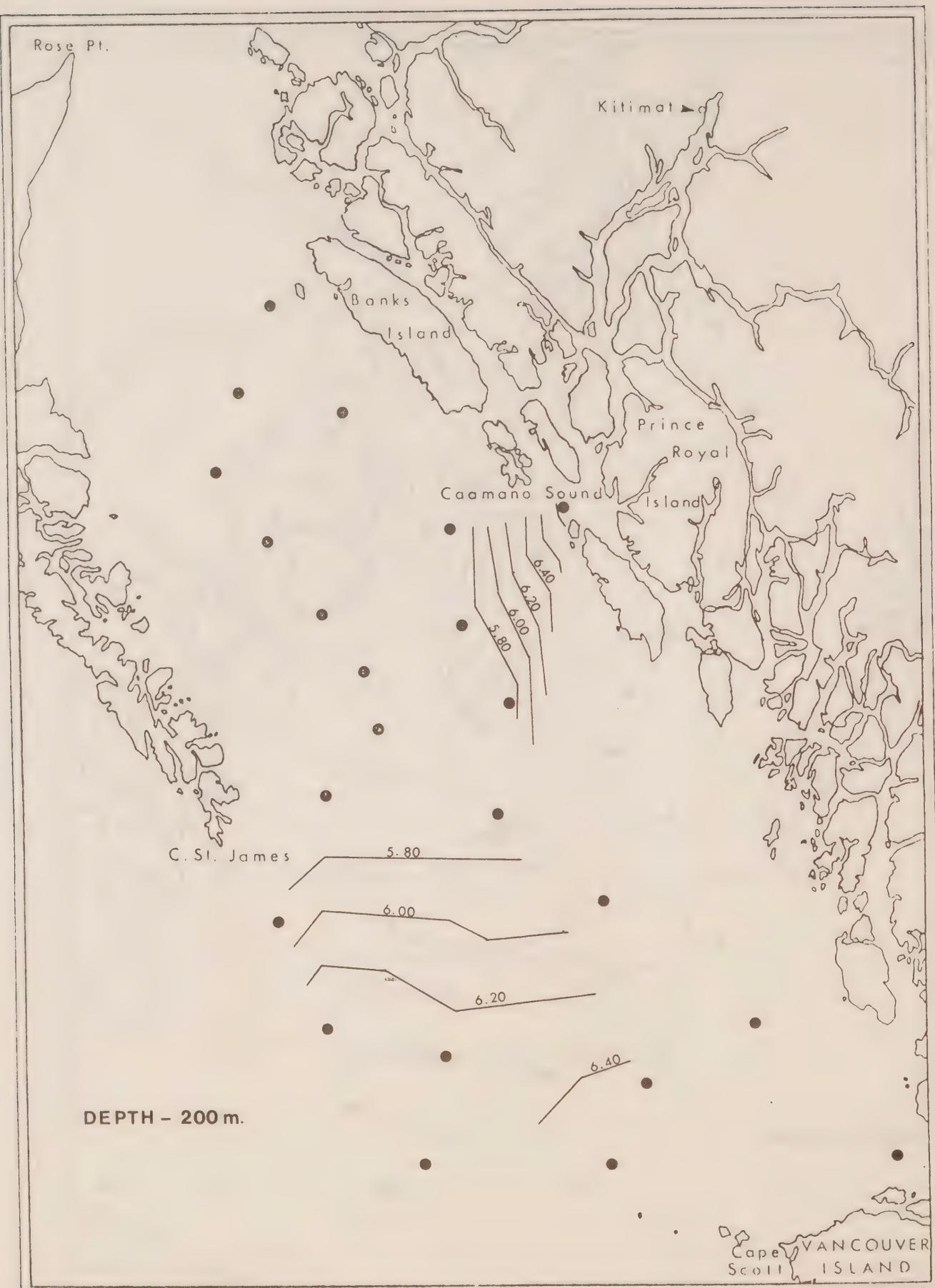


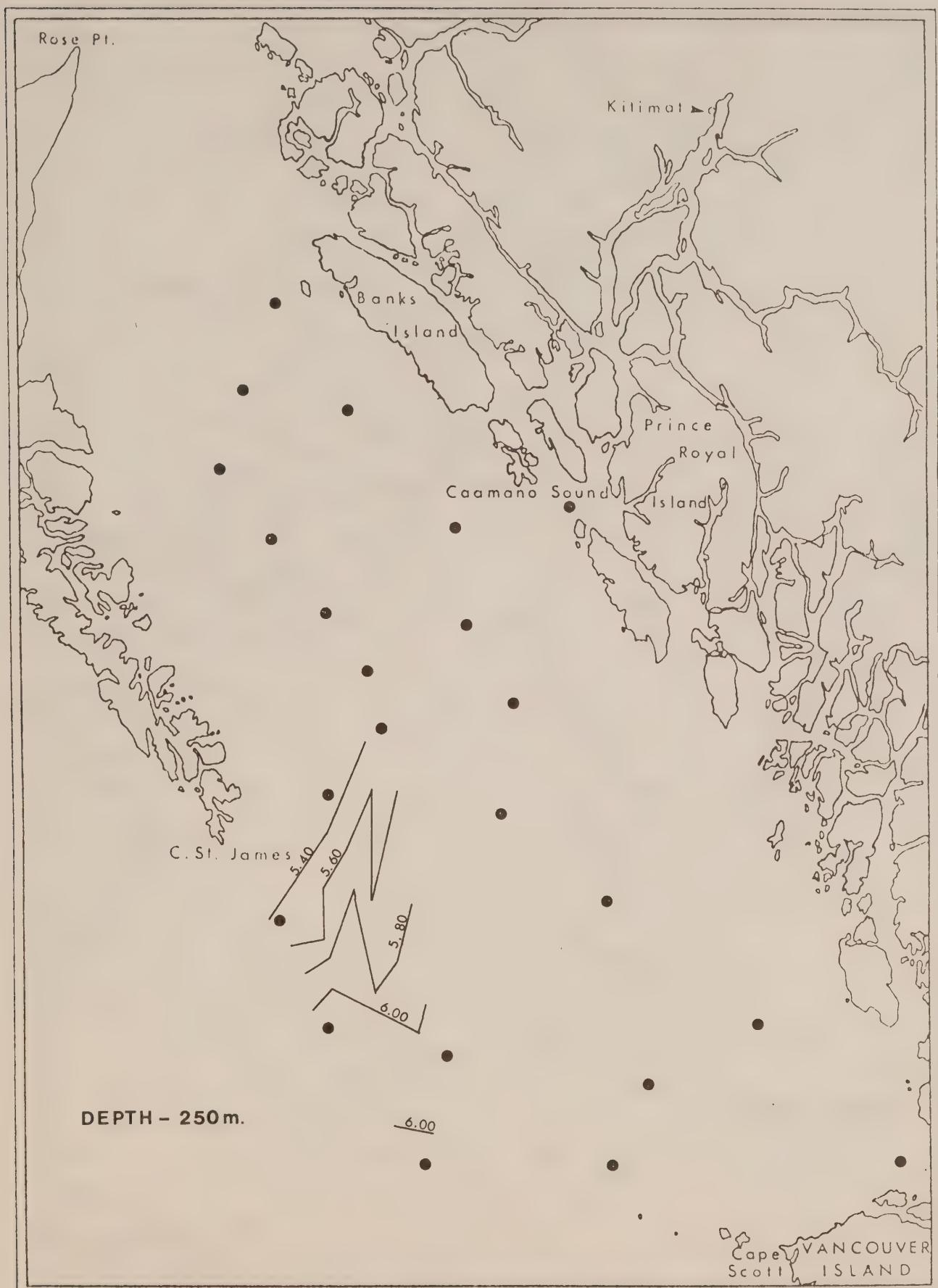


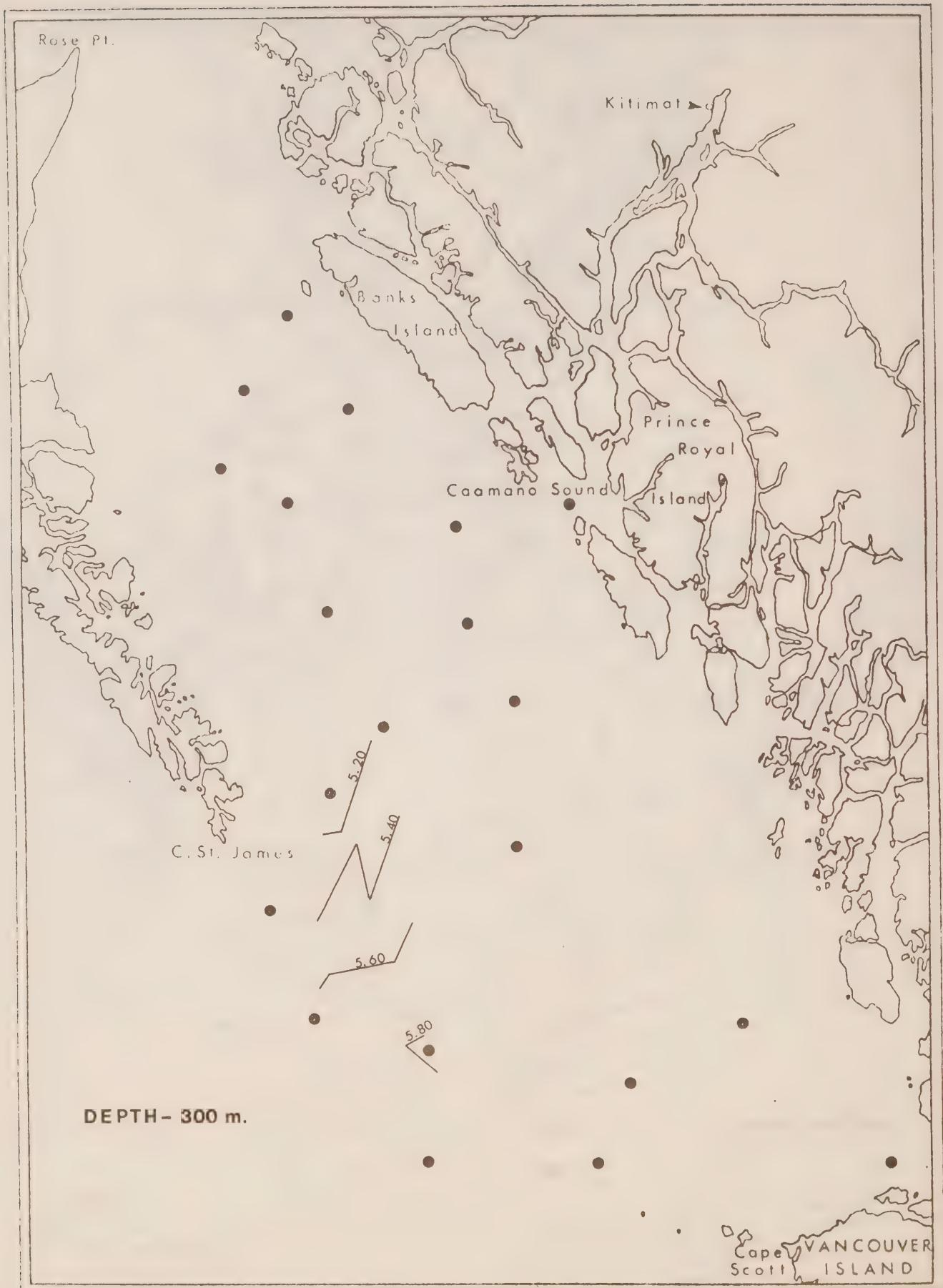


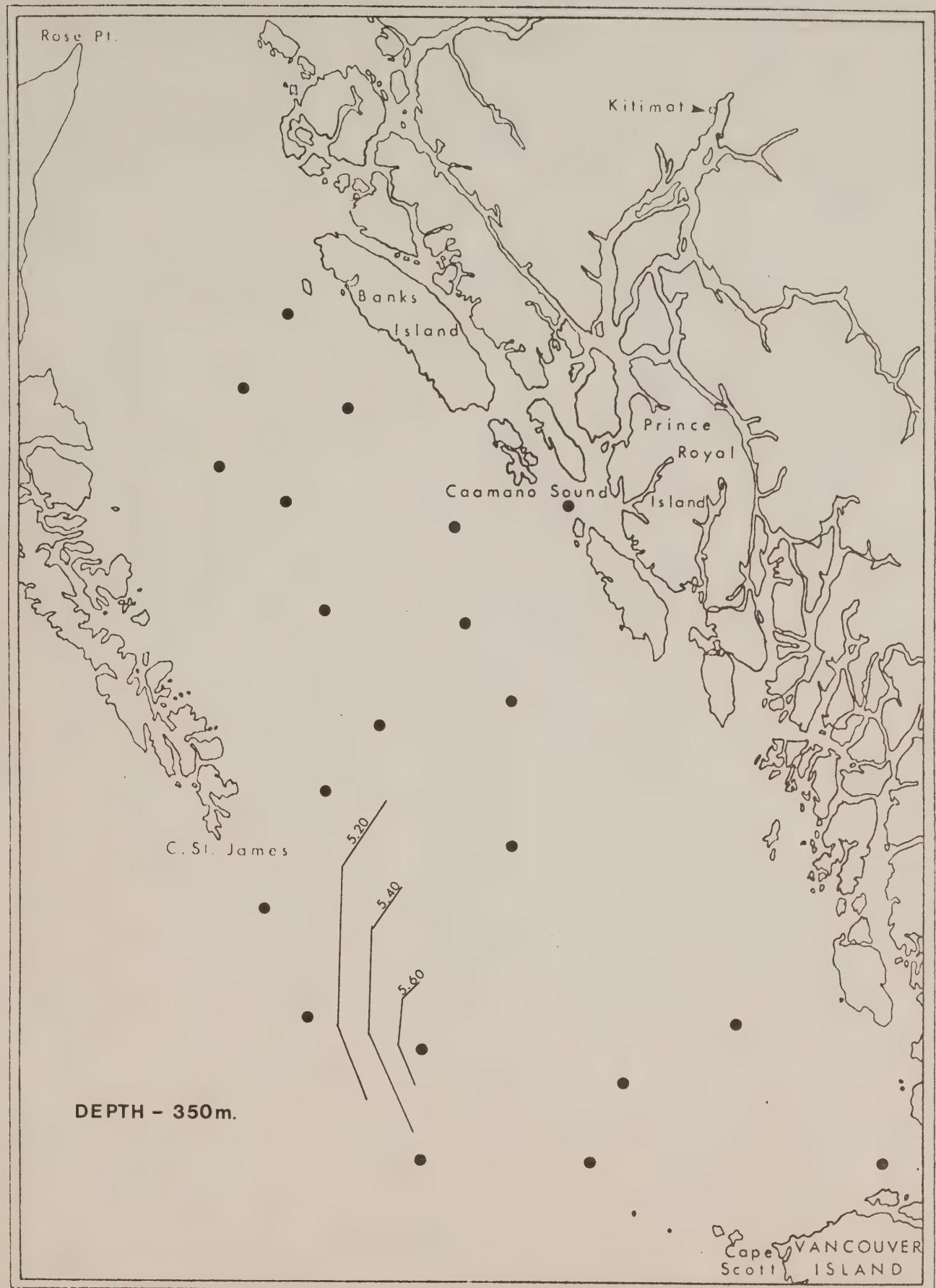




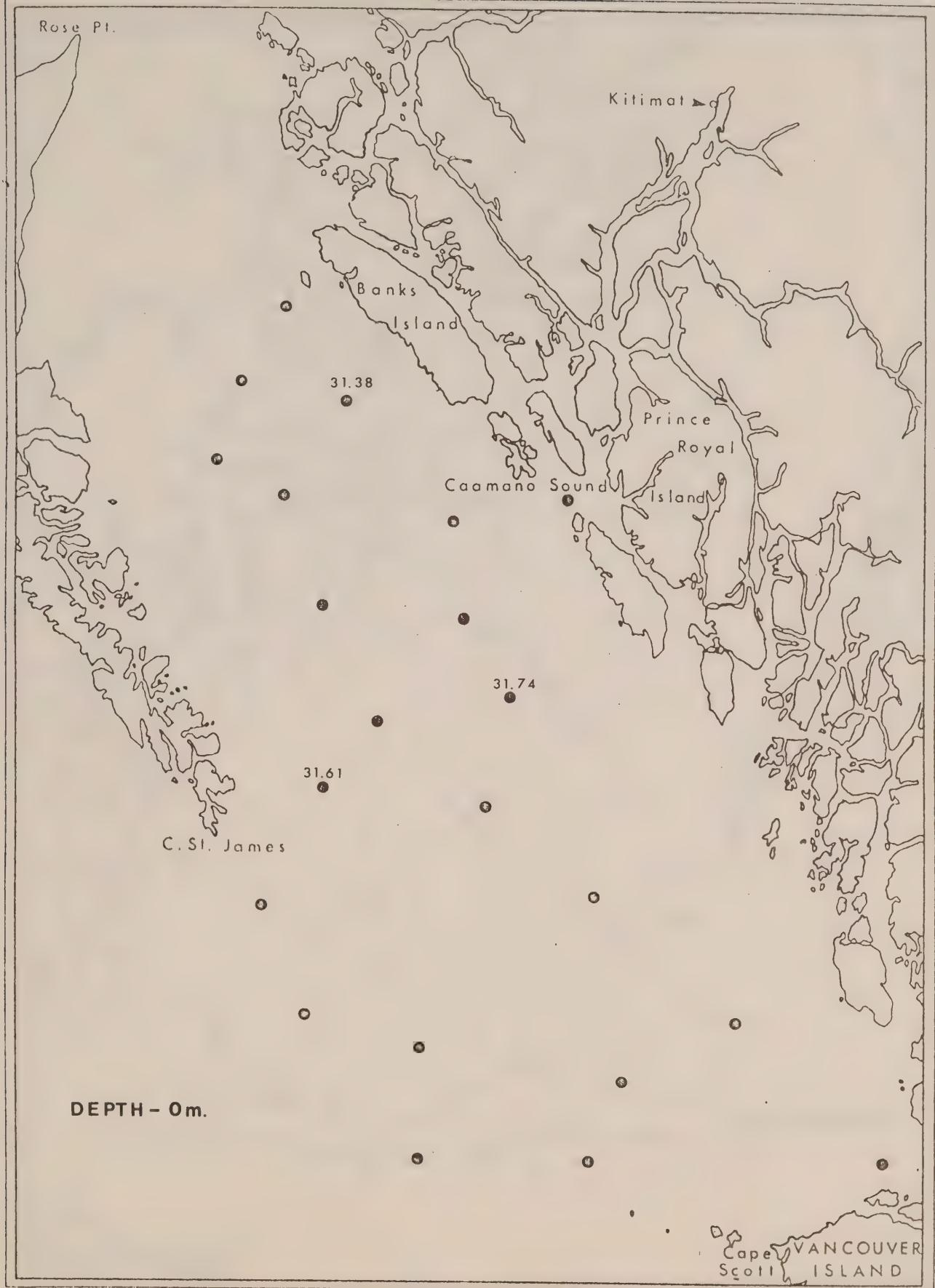


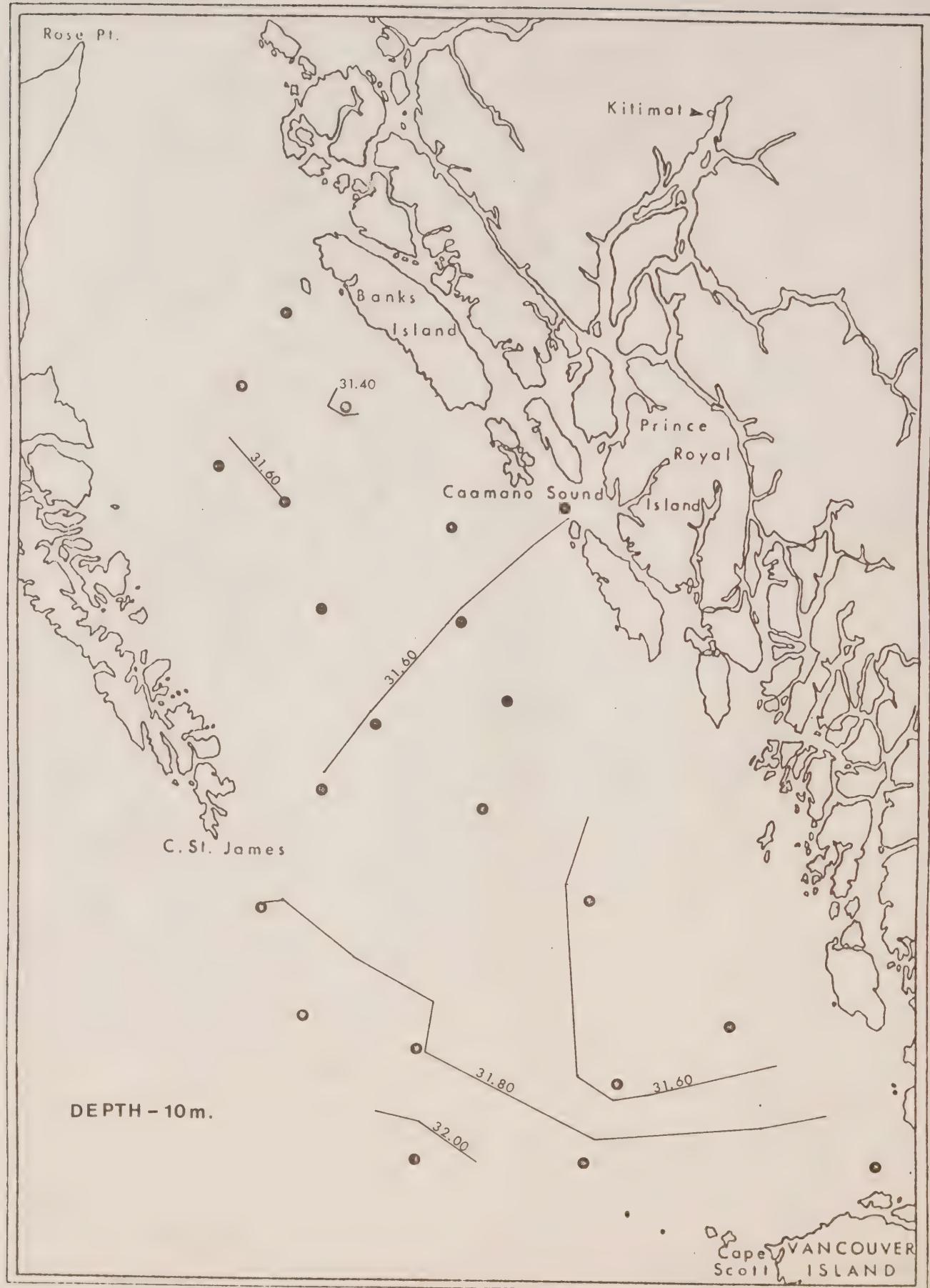


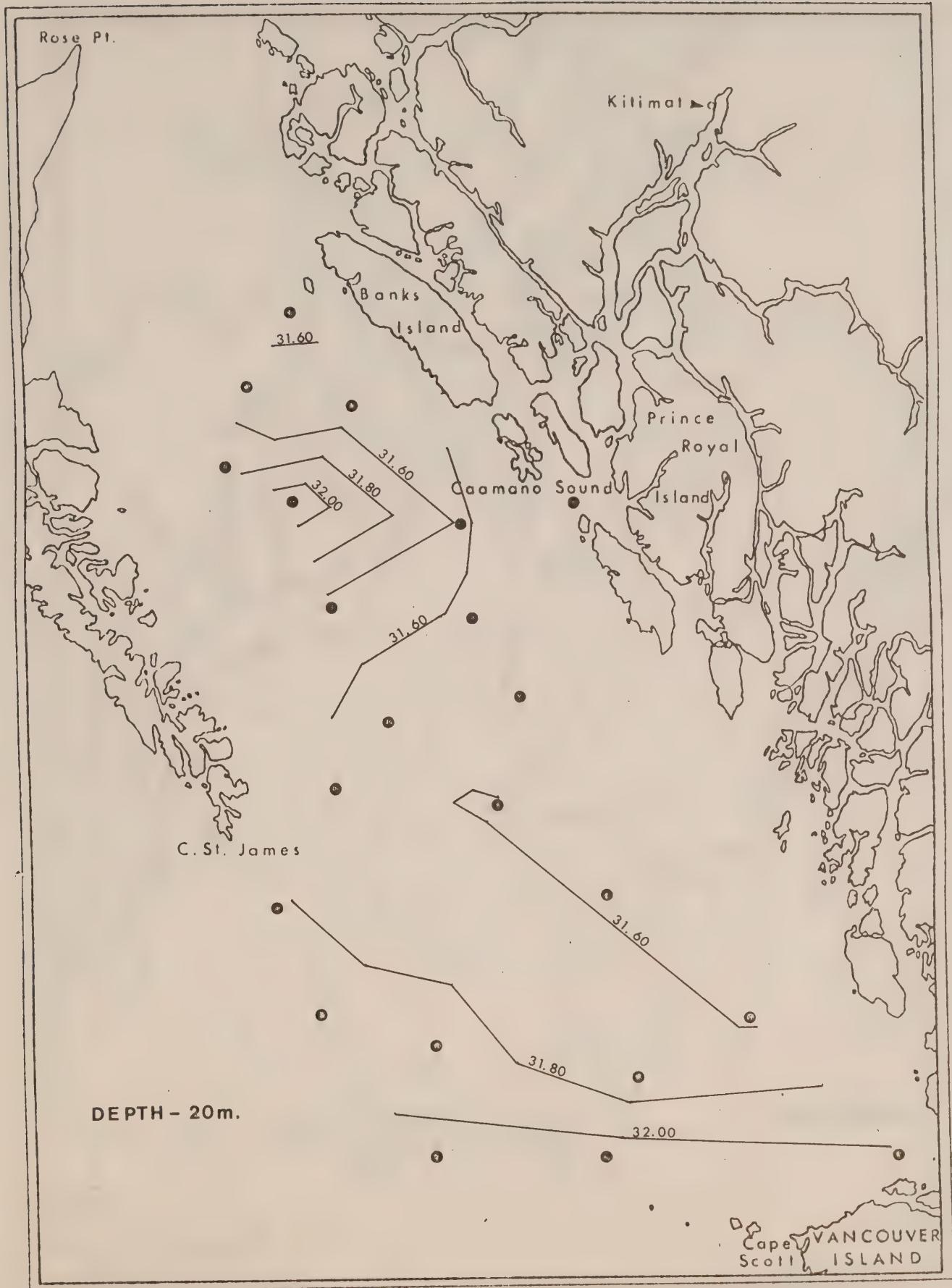


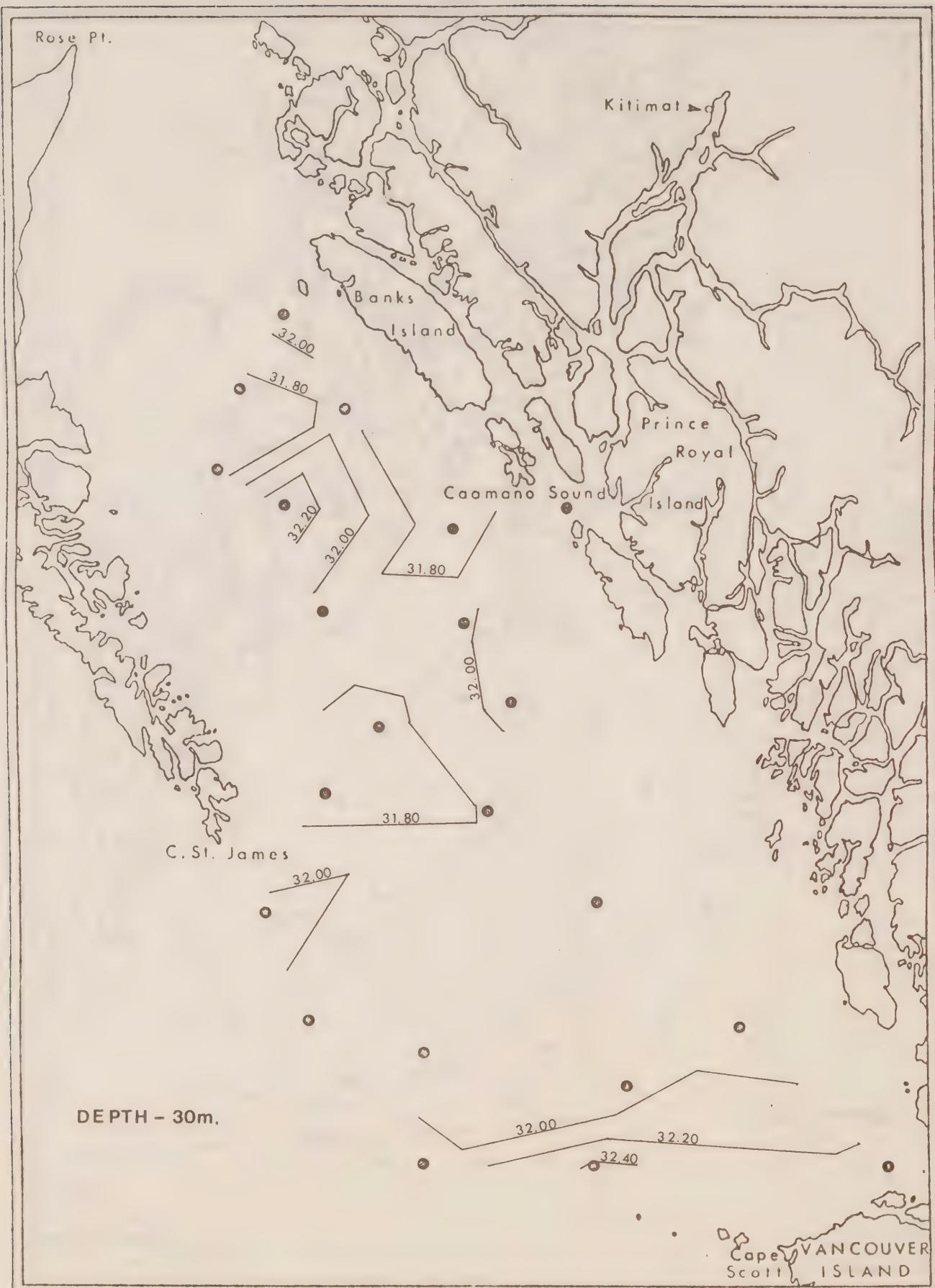


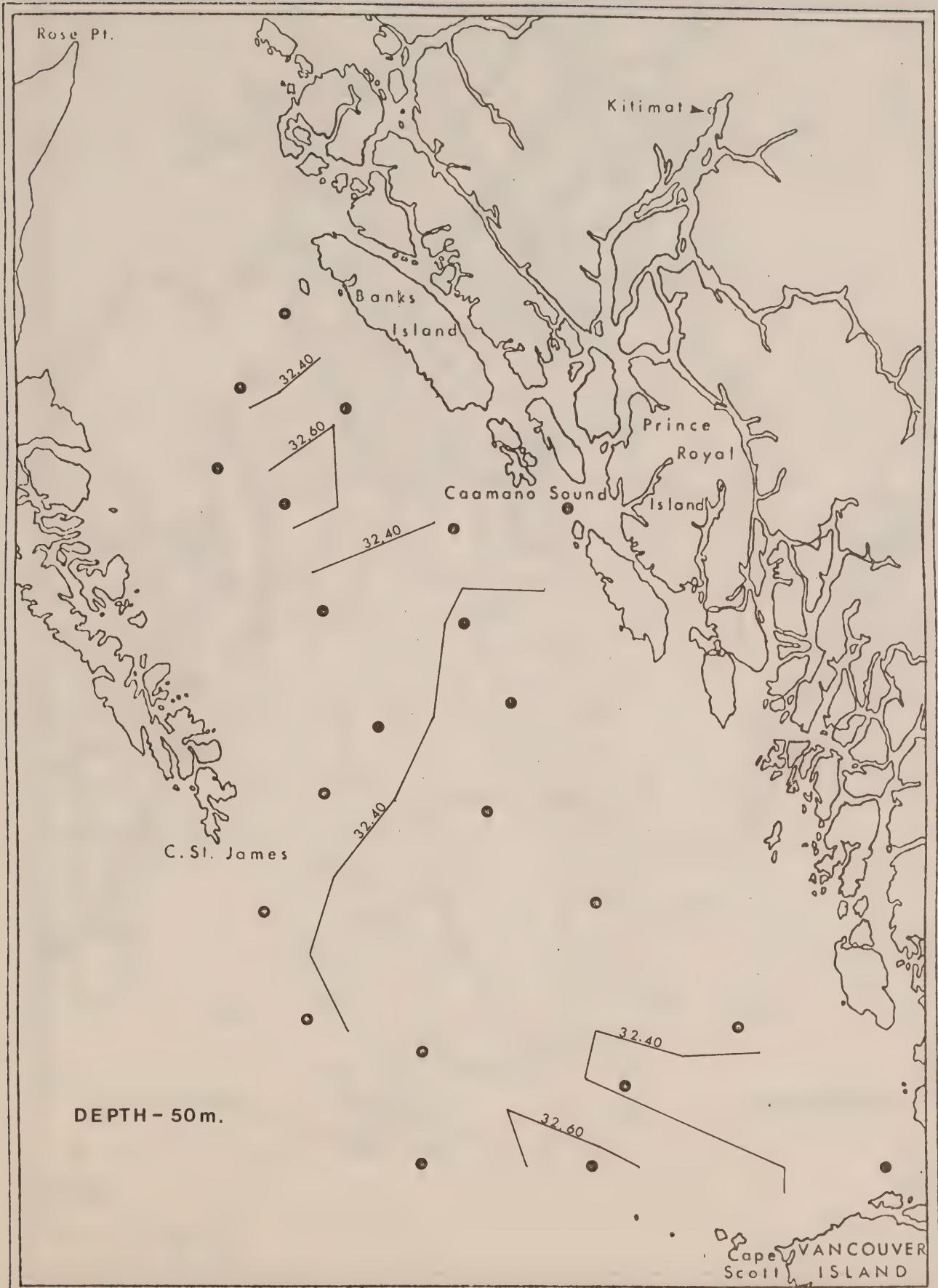
SALINITY
($^{\circ}/\text{oo}$)

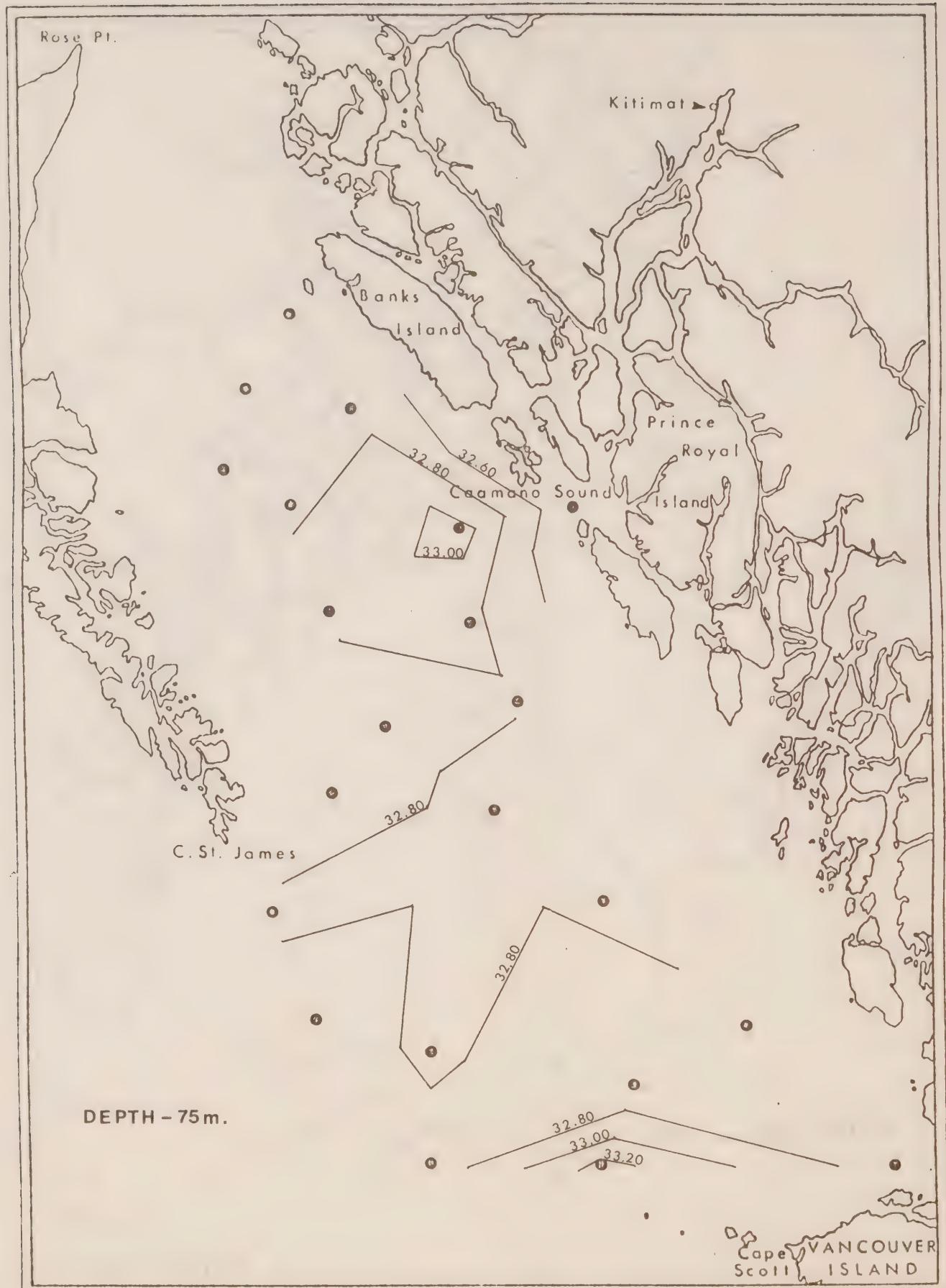


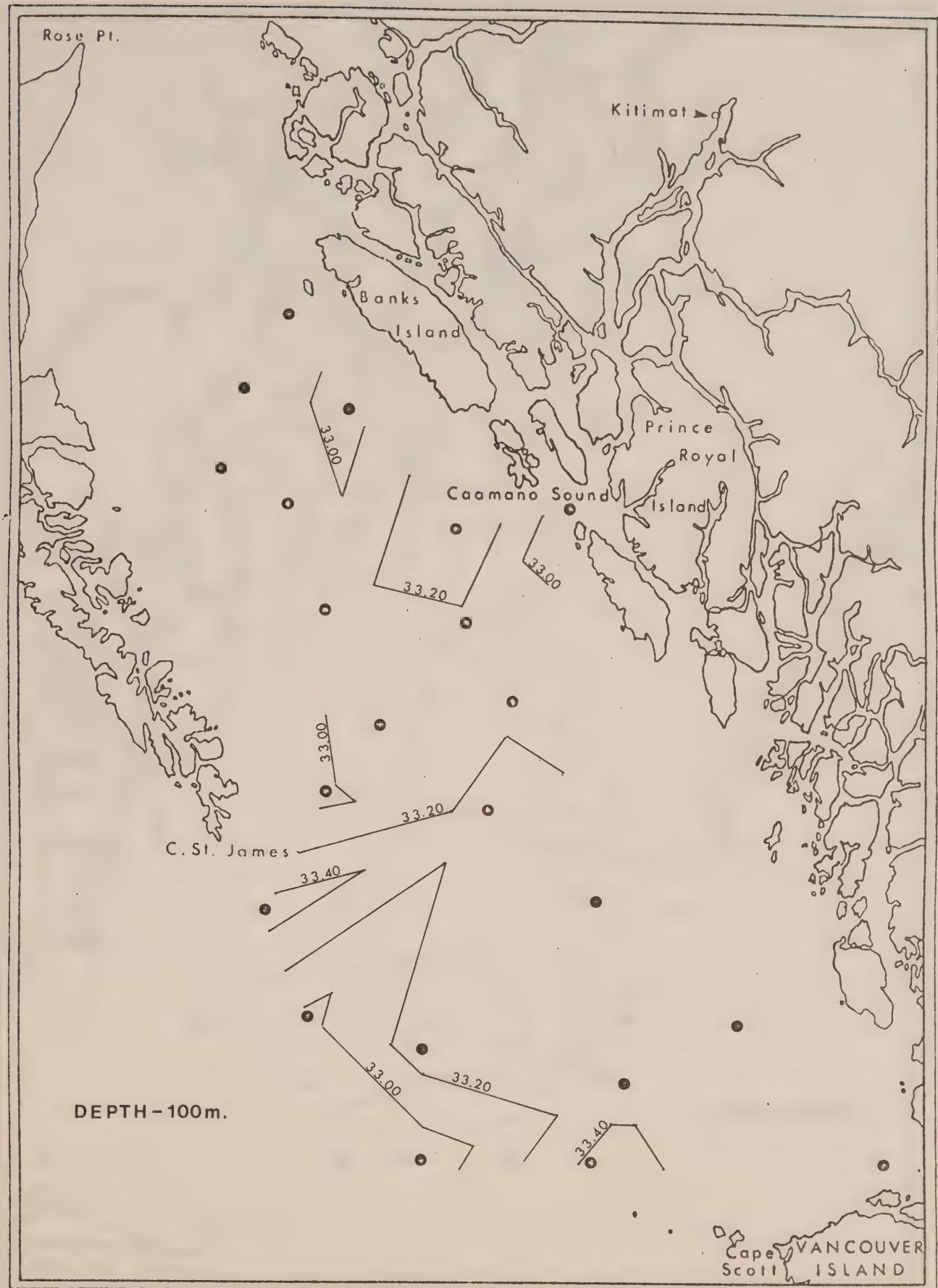


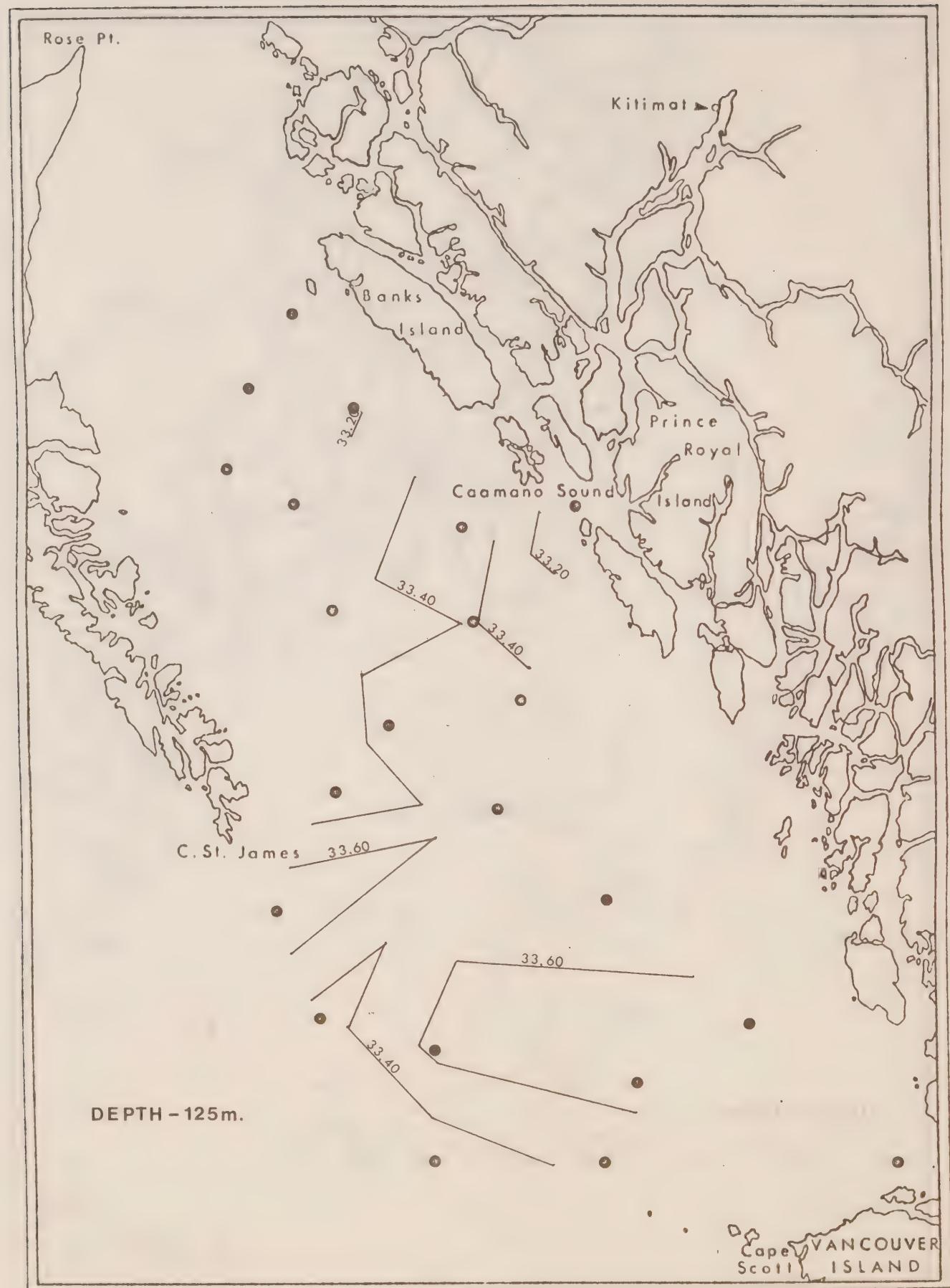


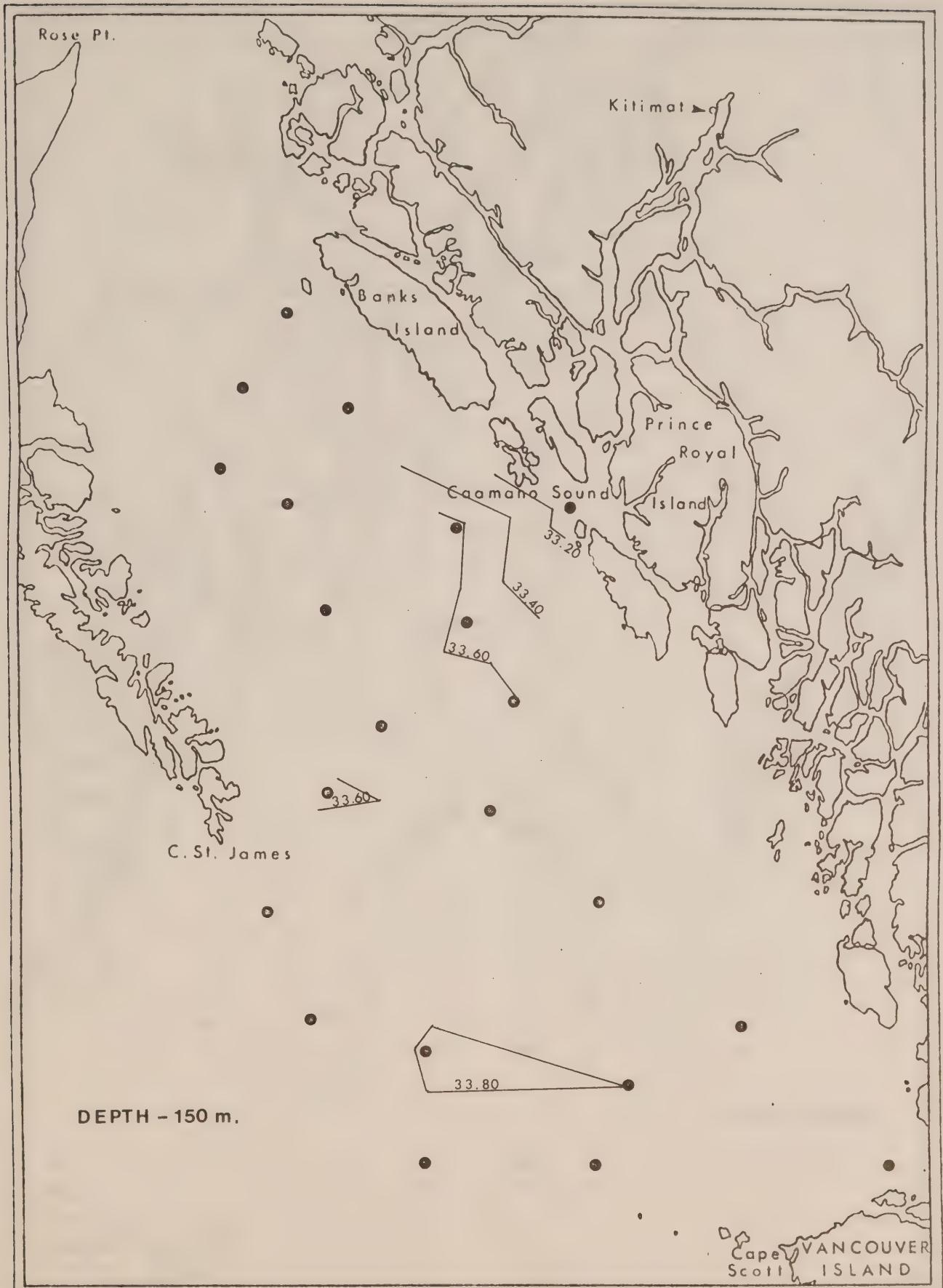


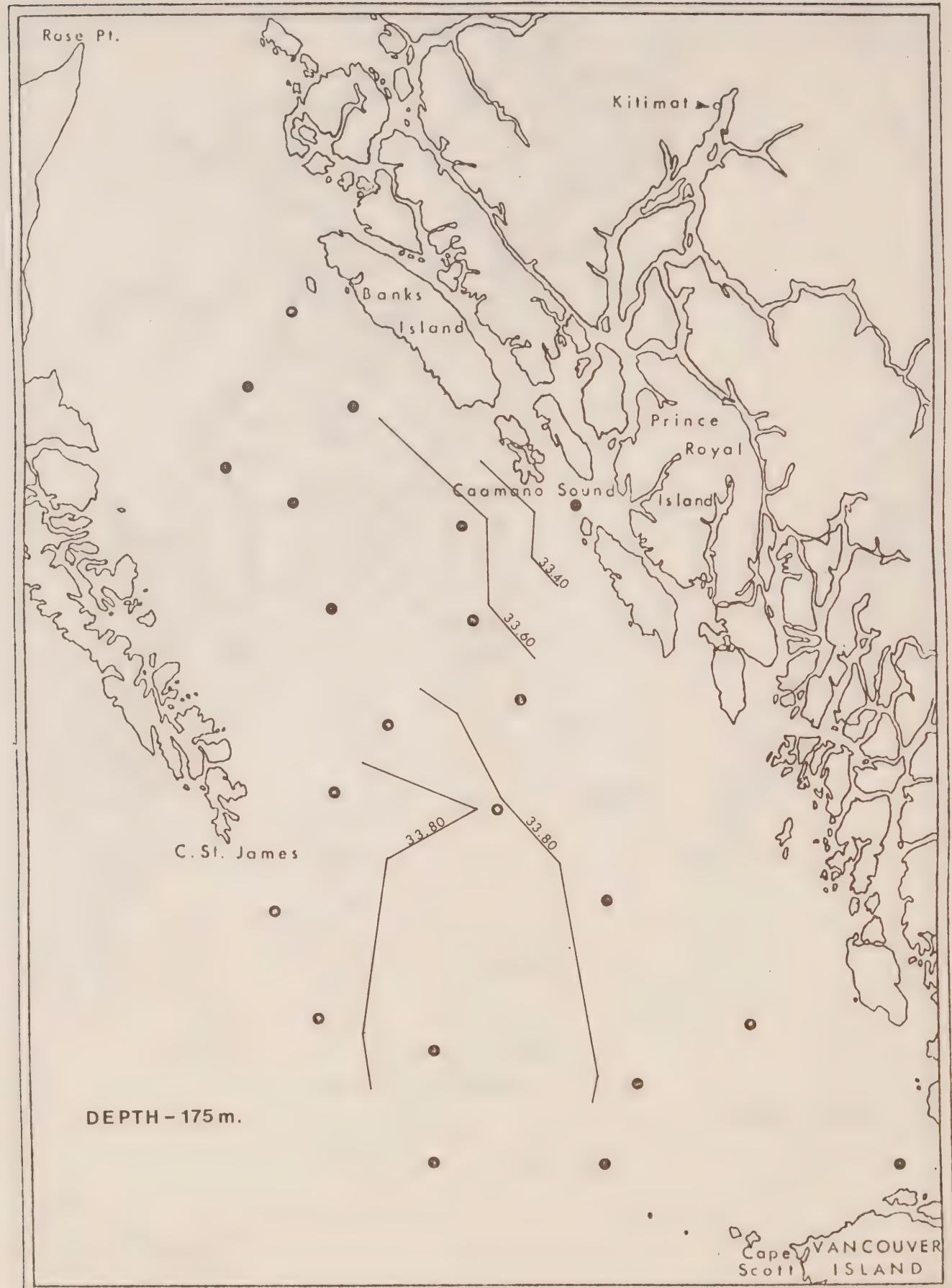


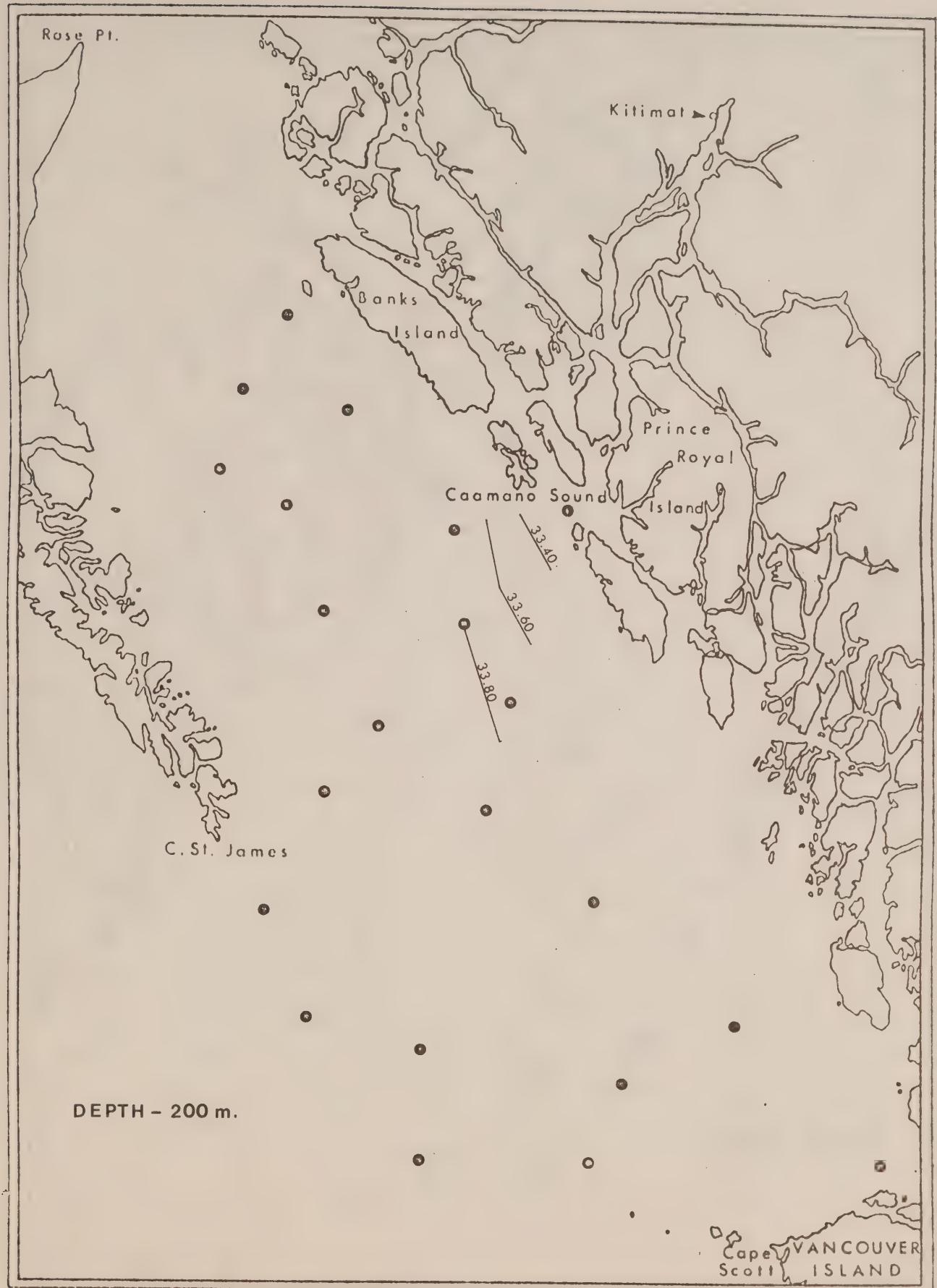


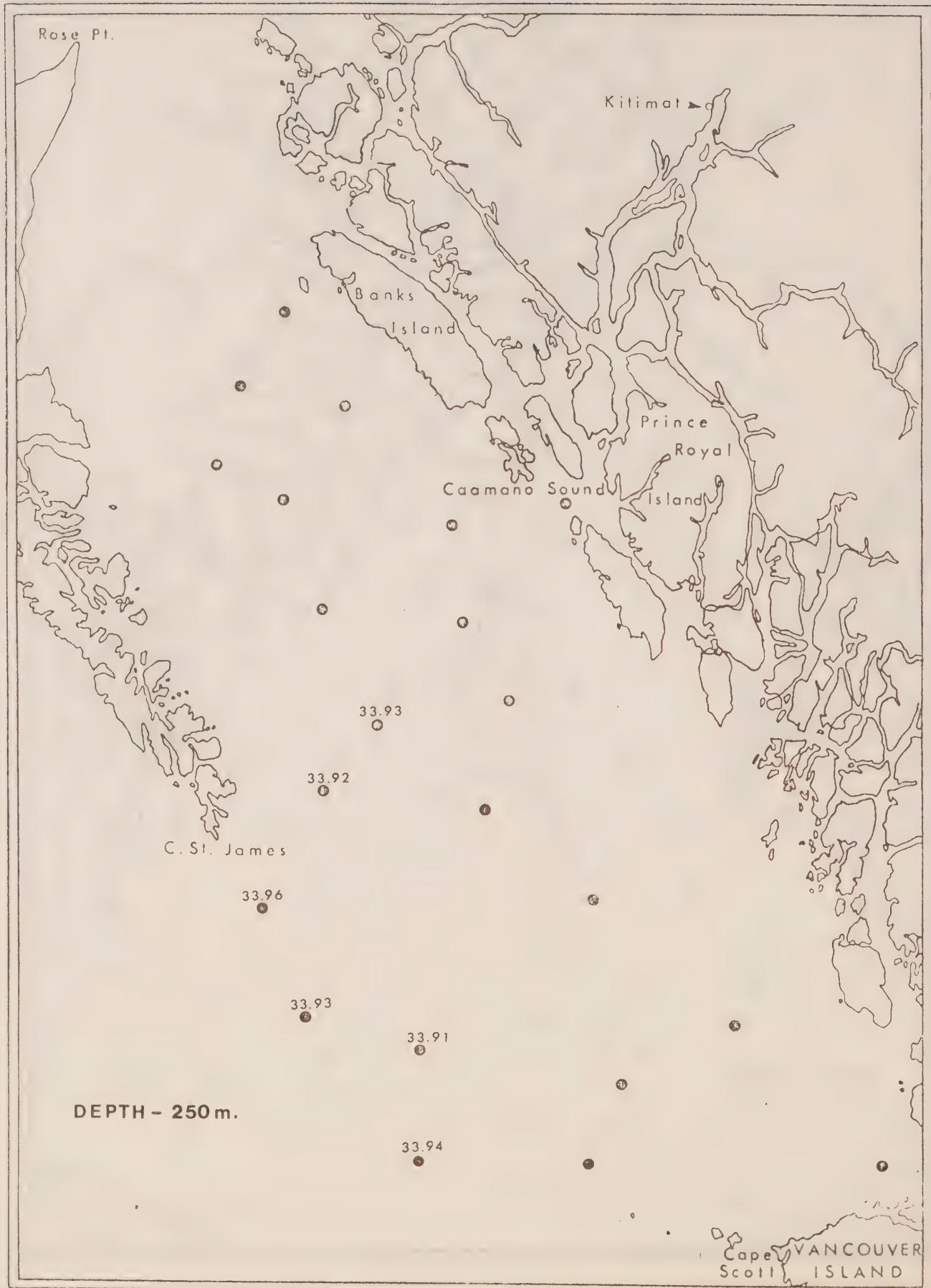


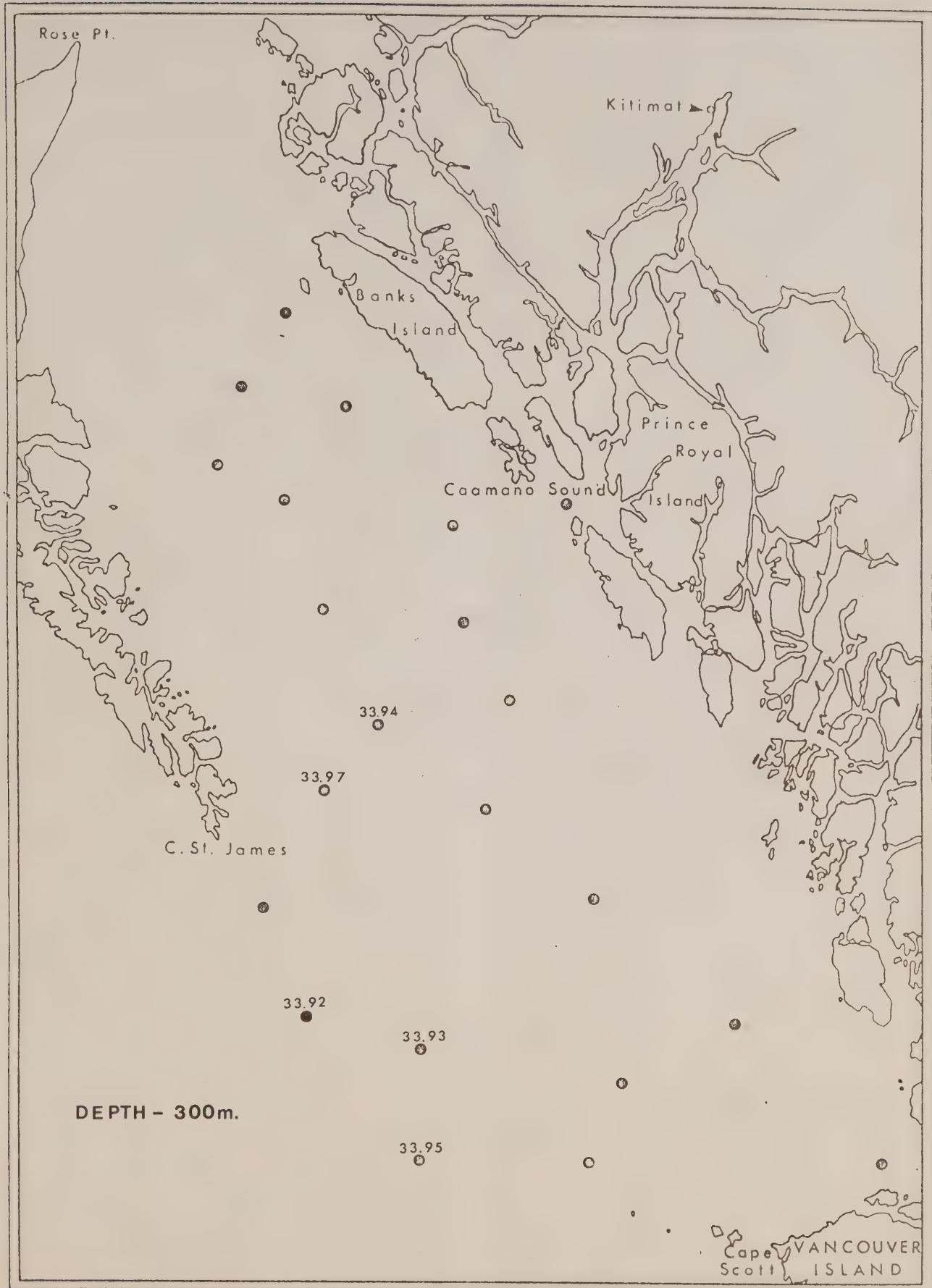


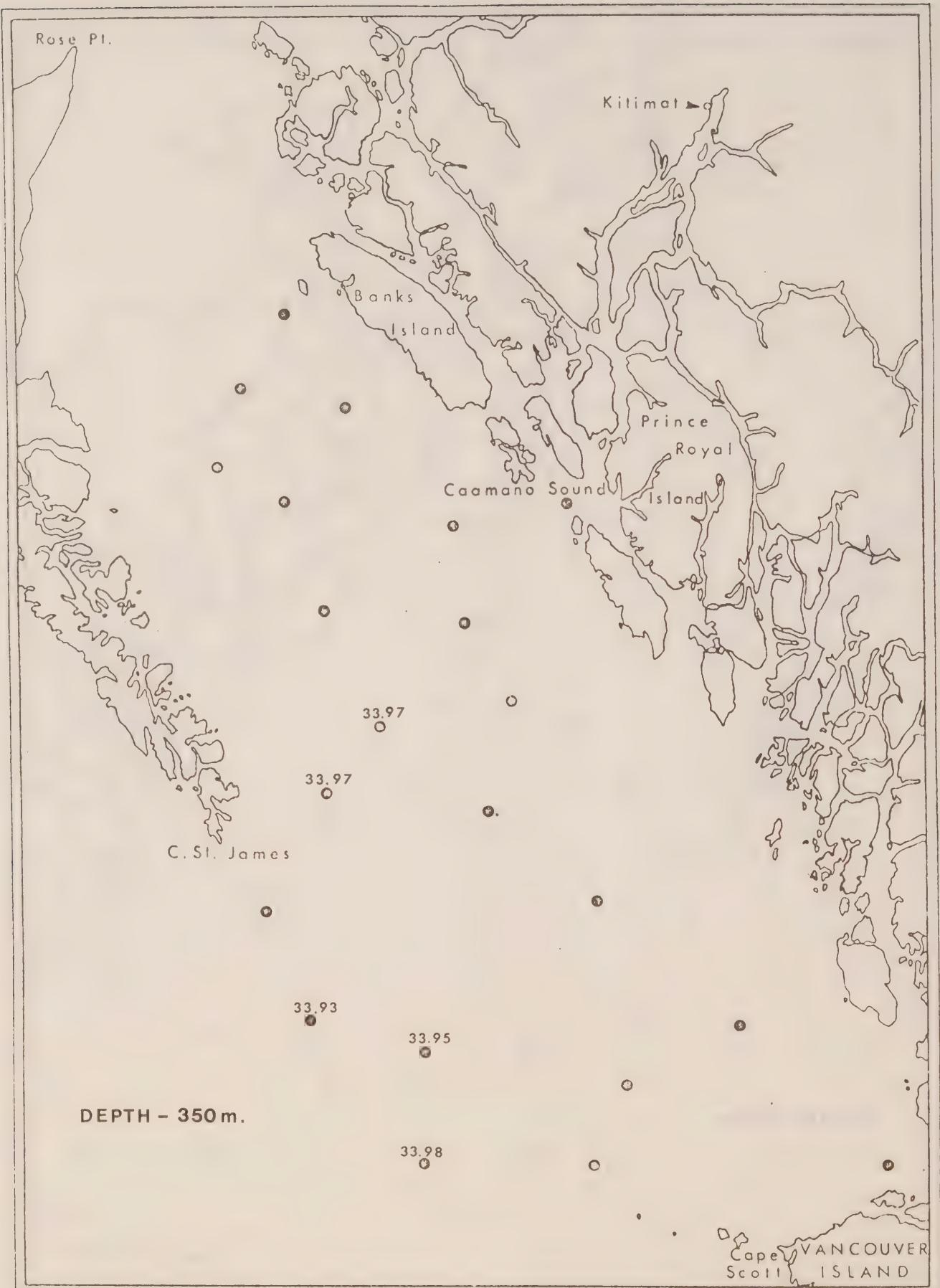




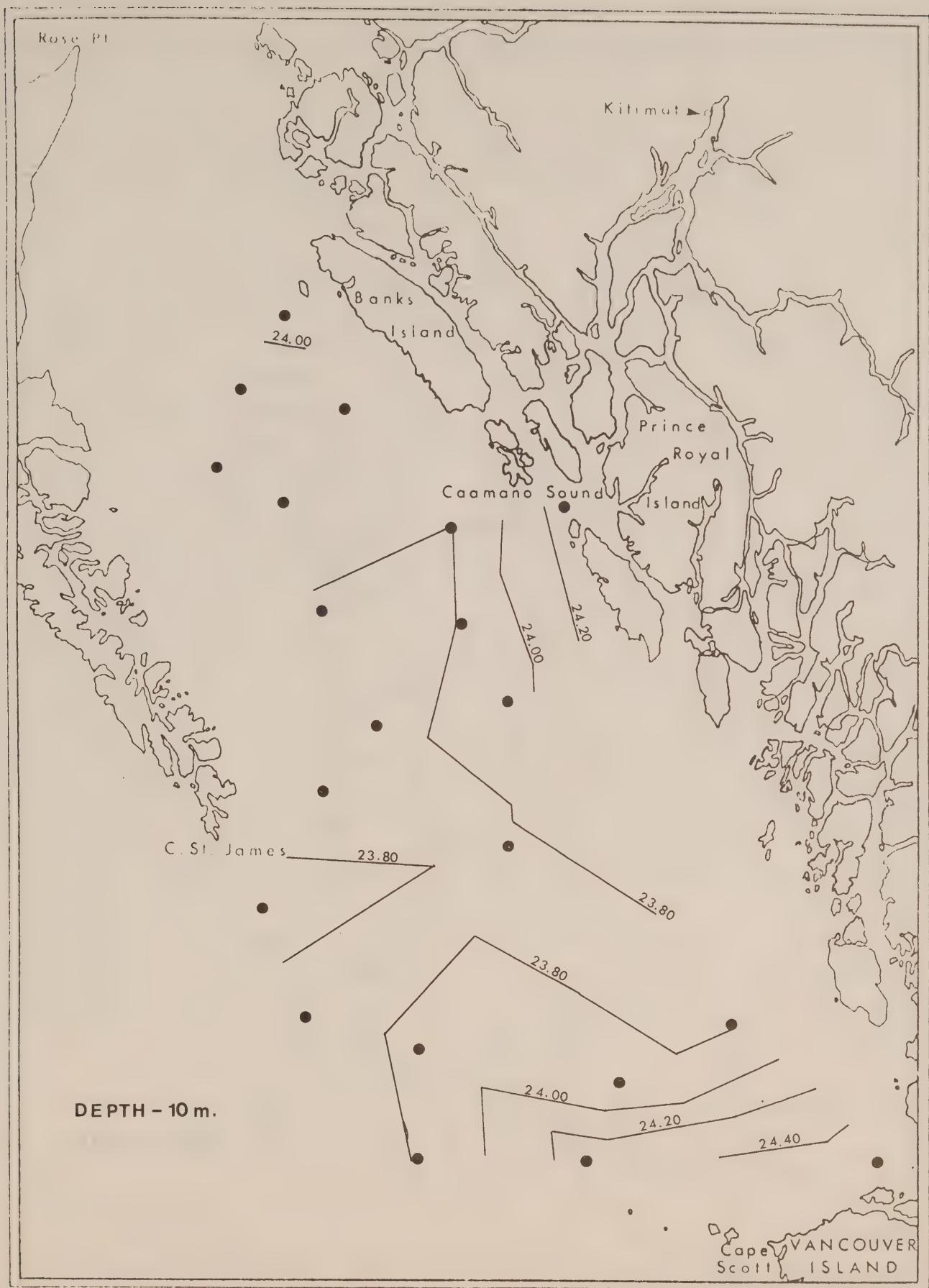


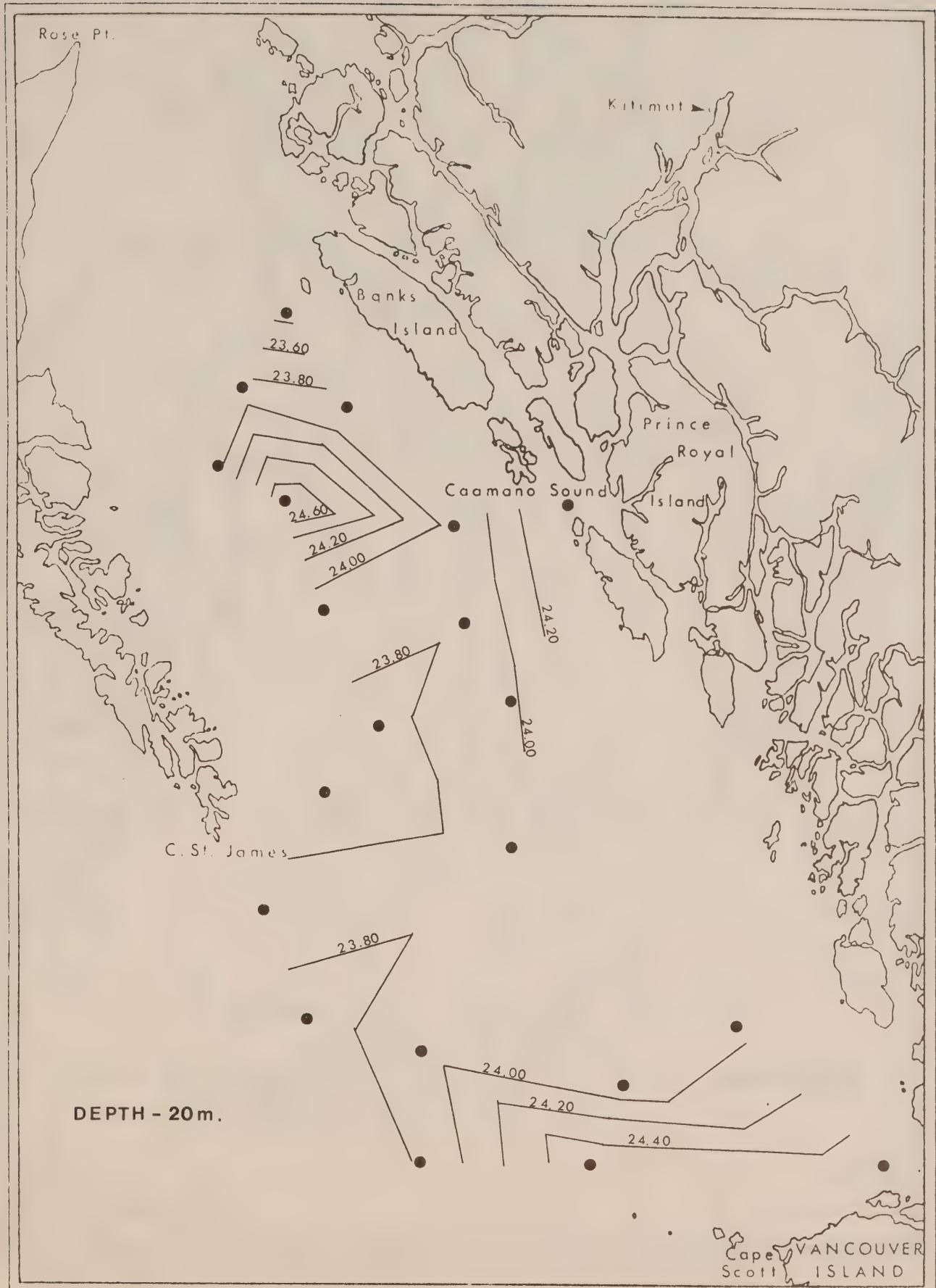


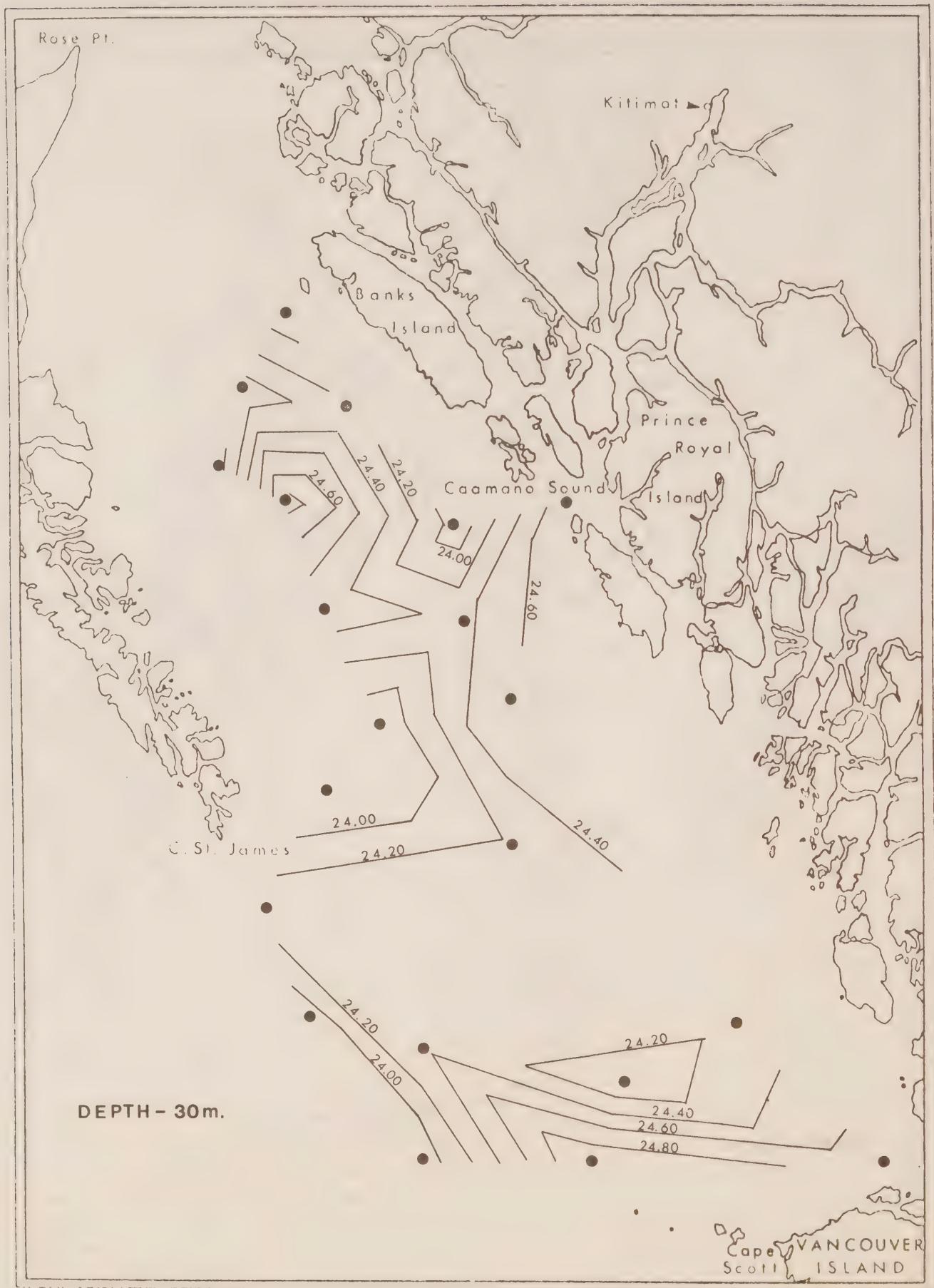


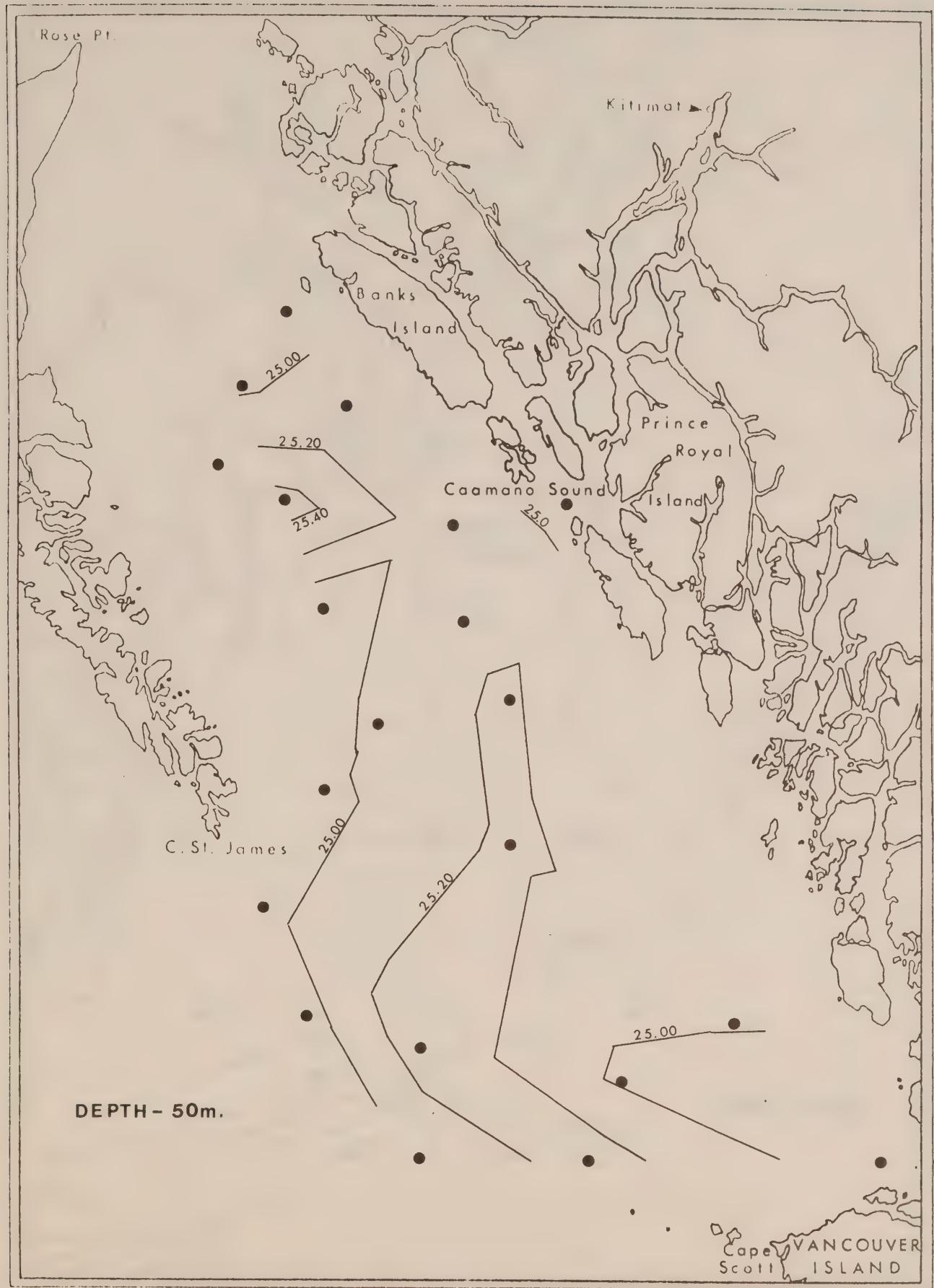


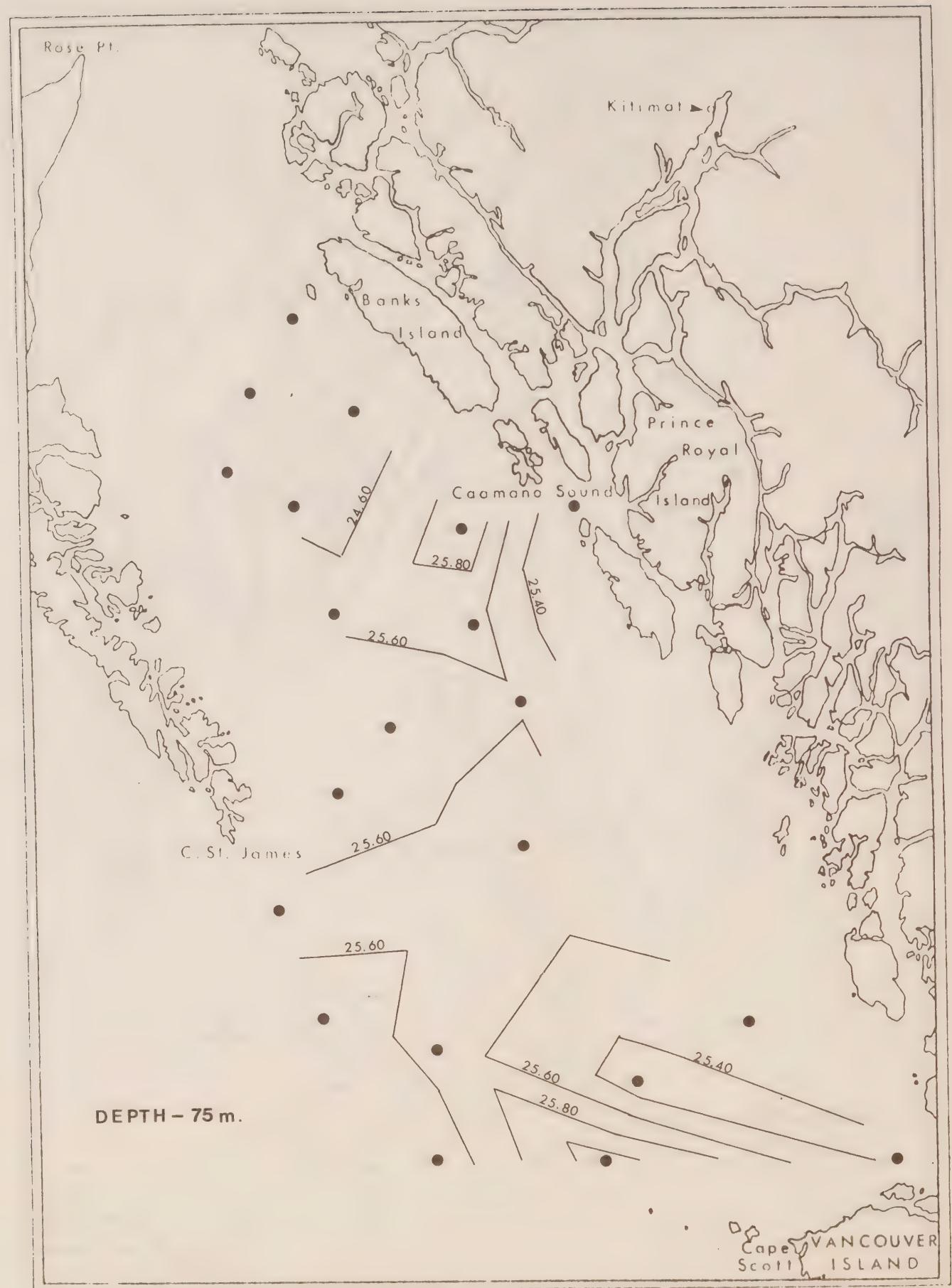
SIGMA-t

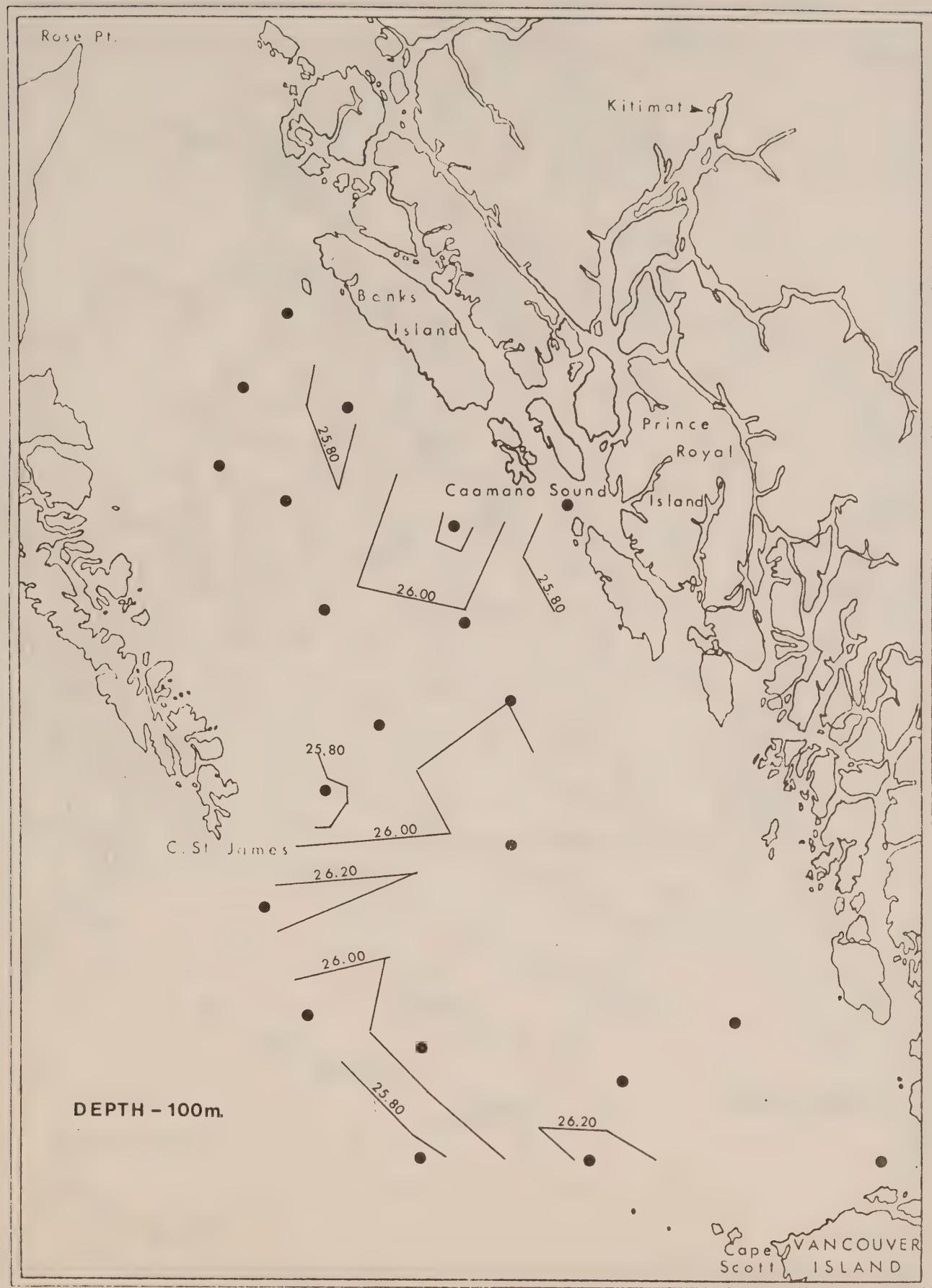


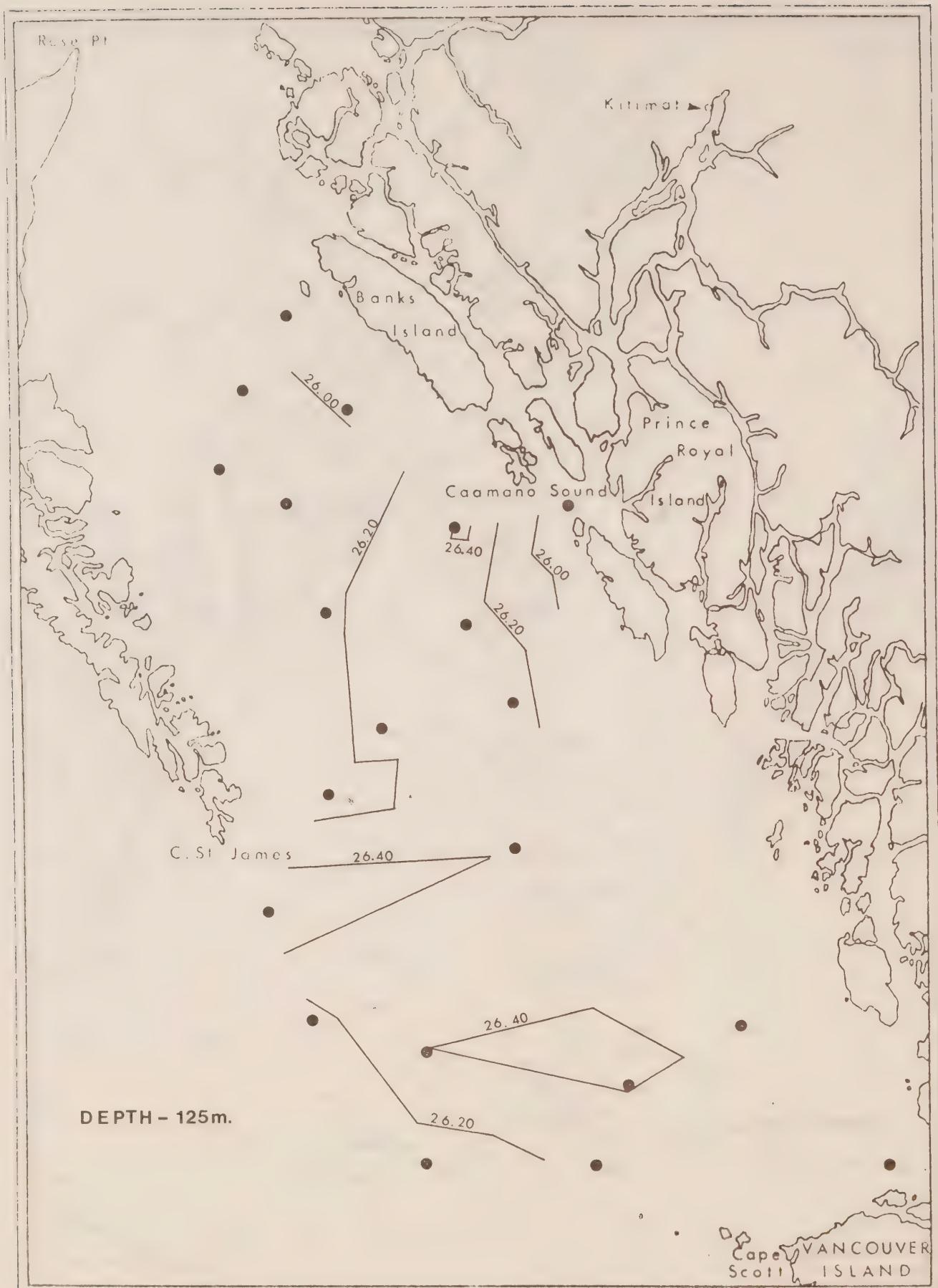


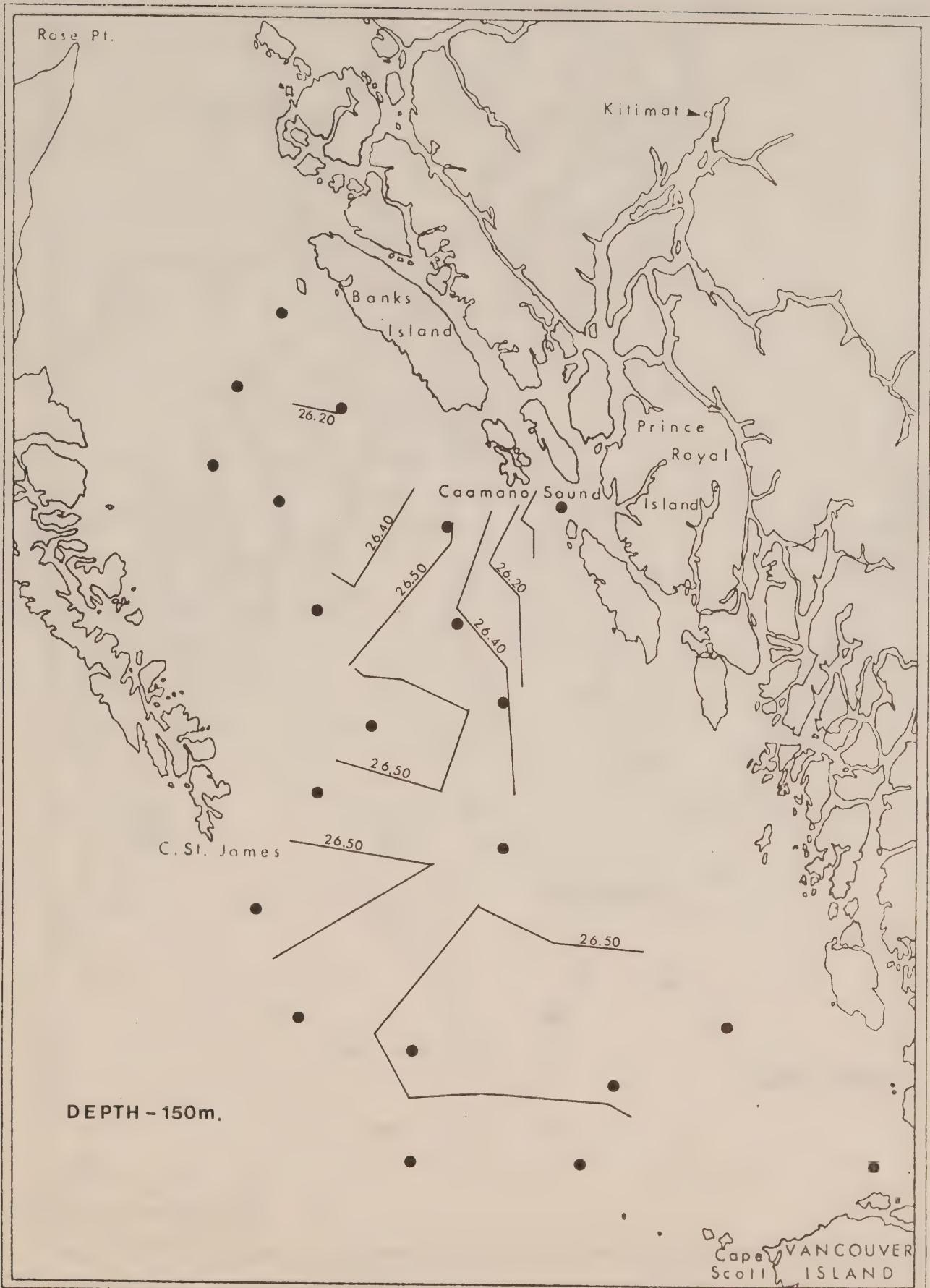


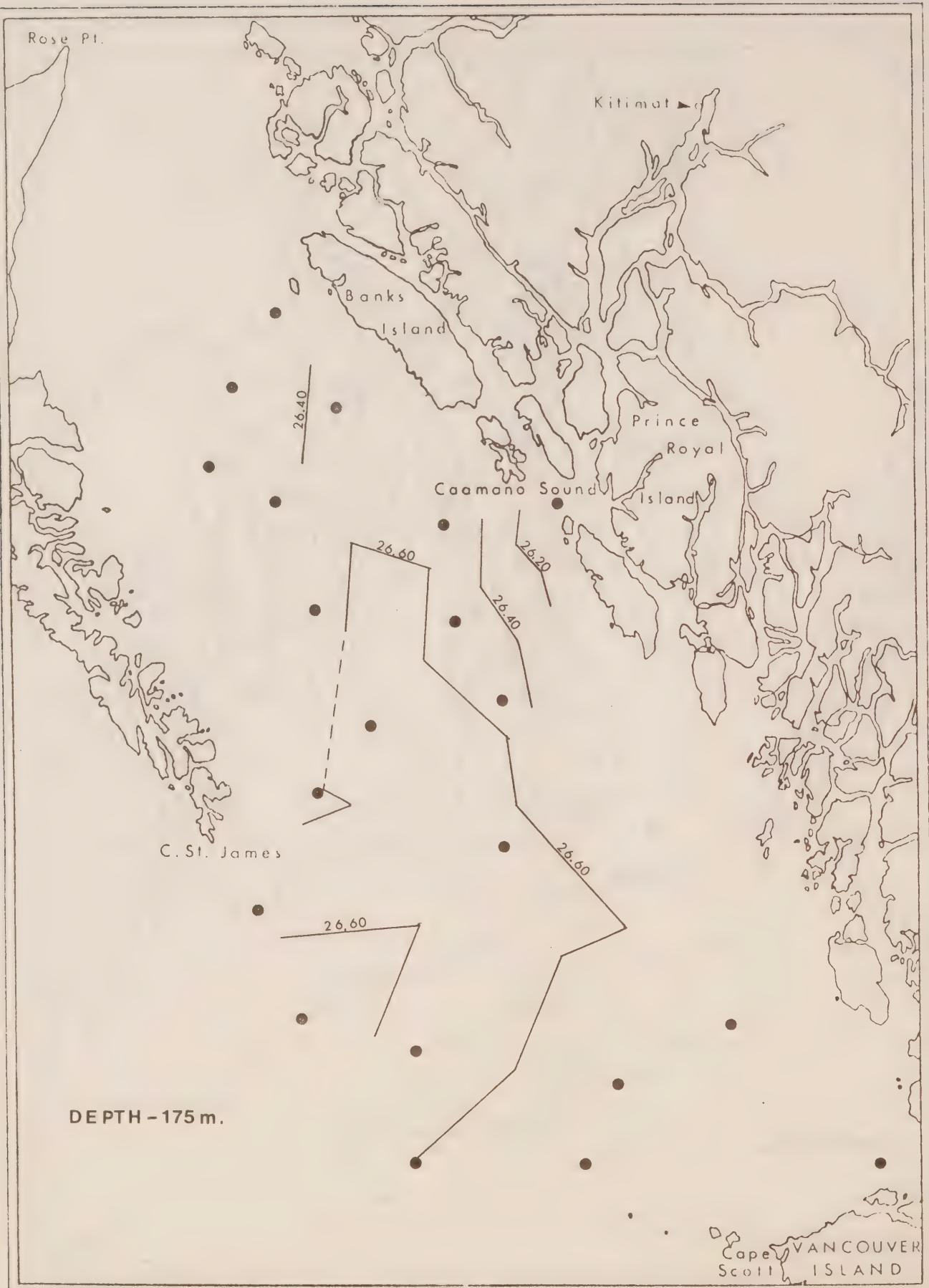


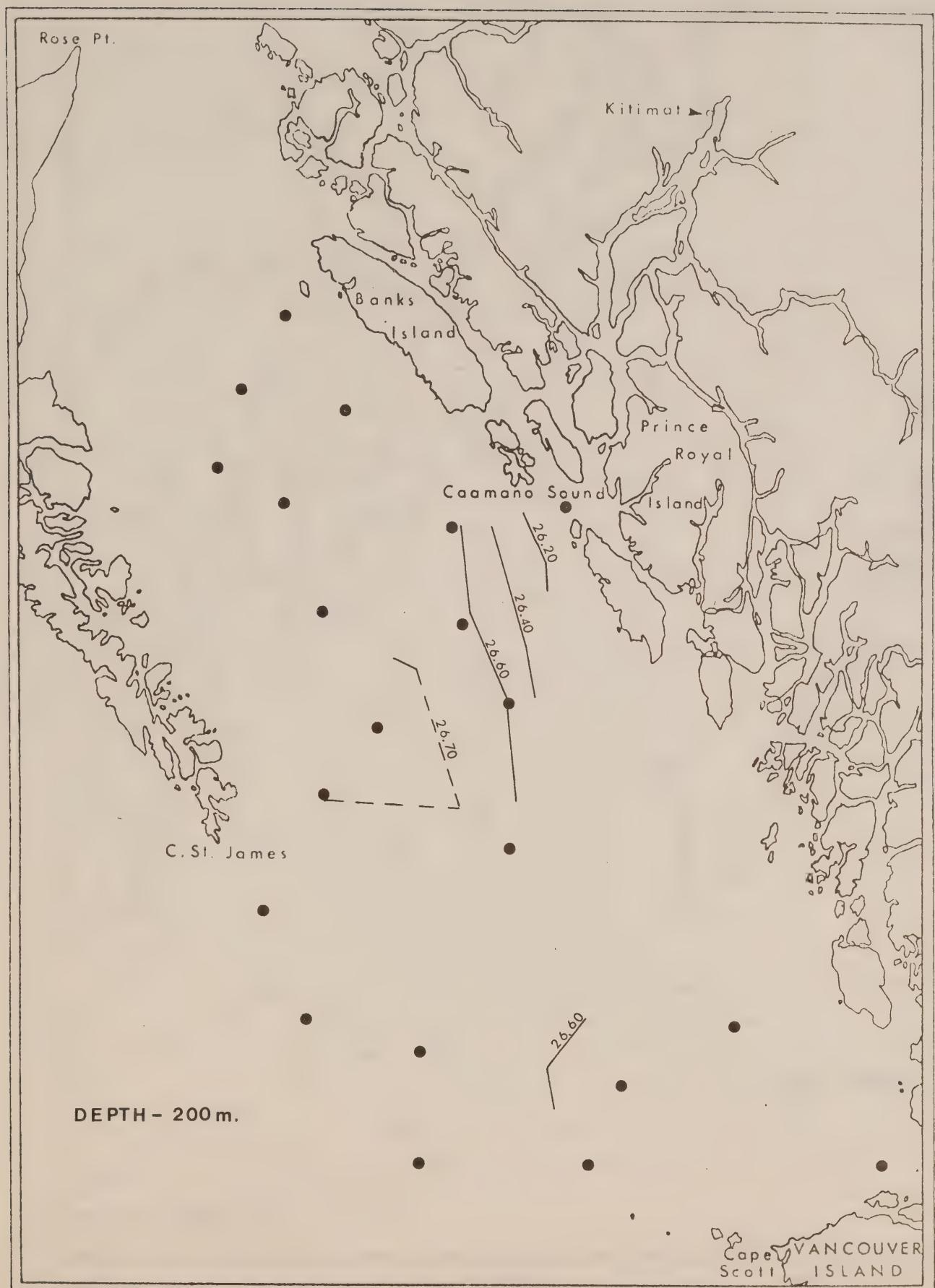


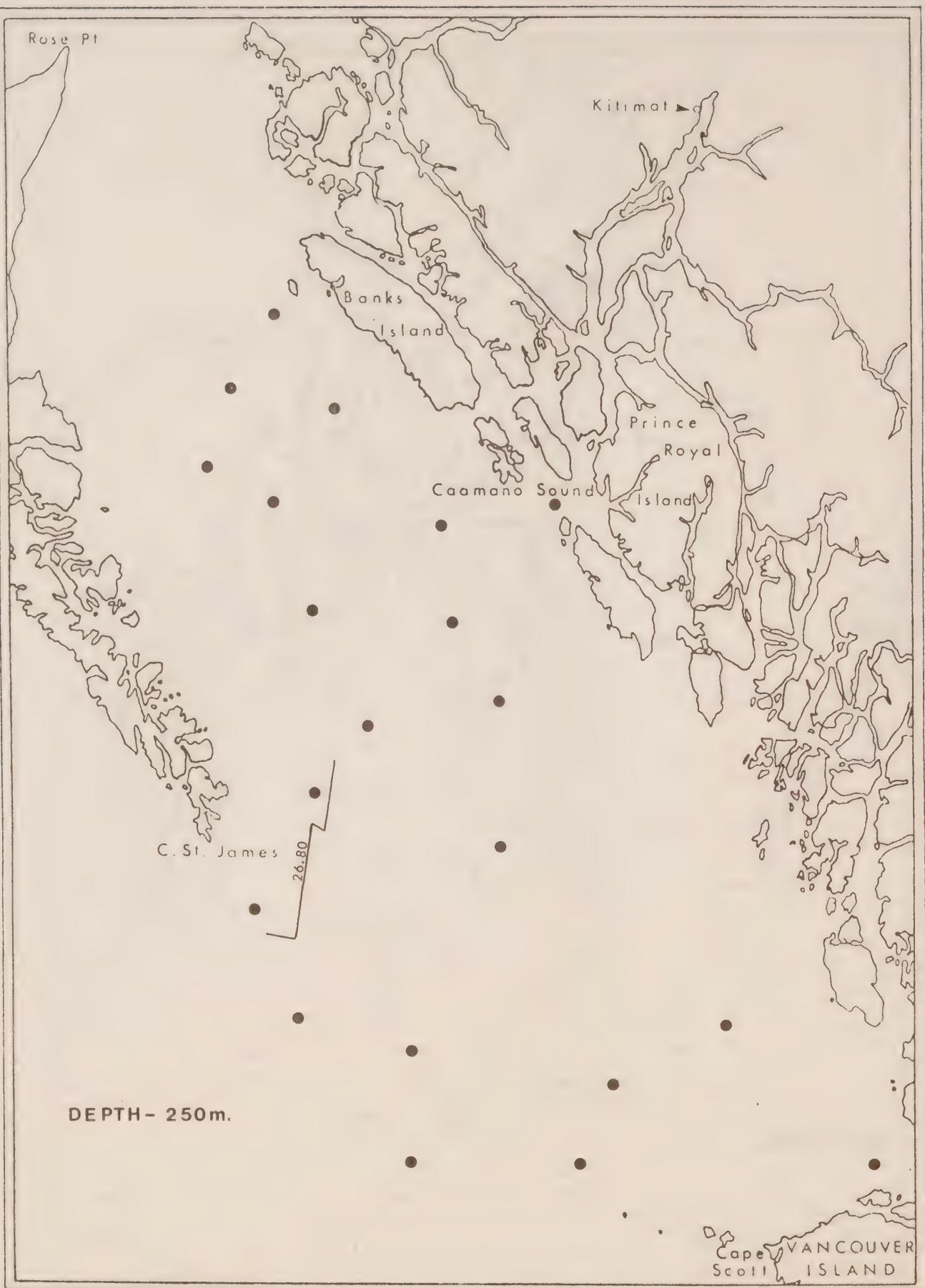


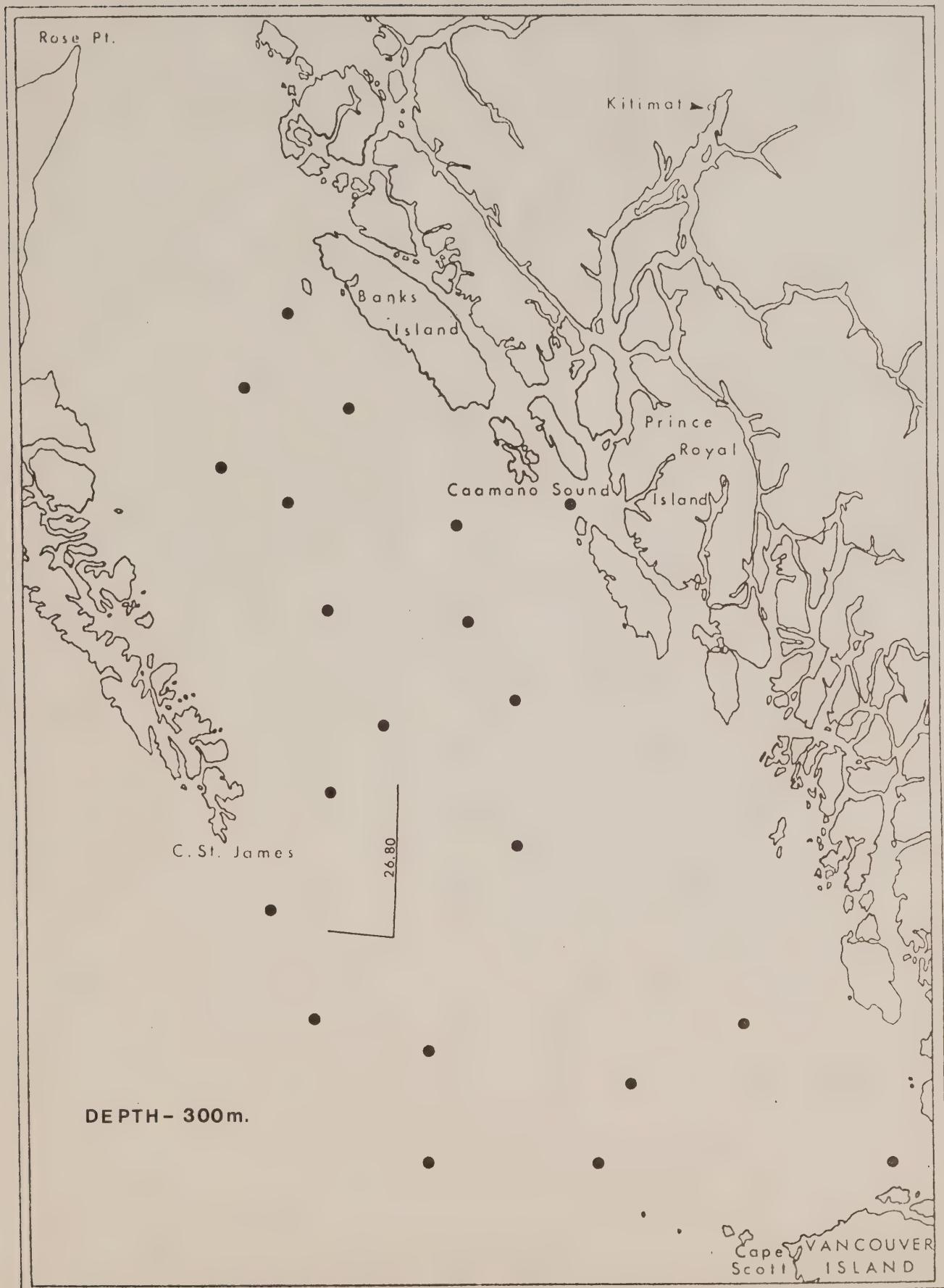






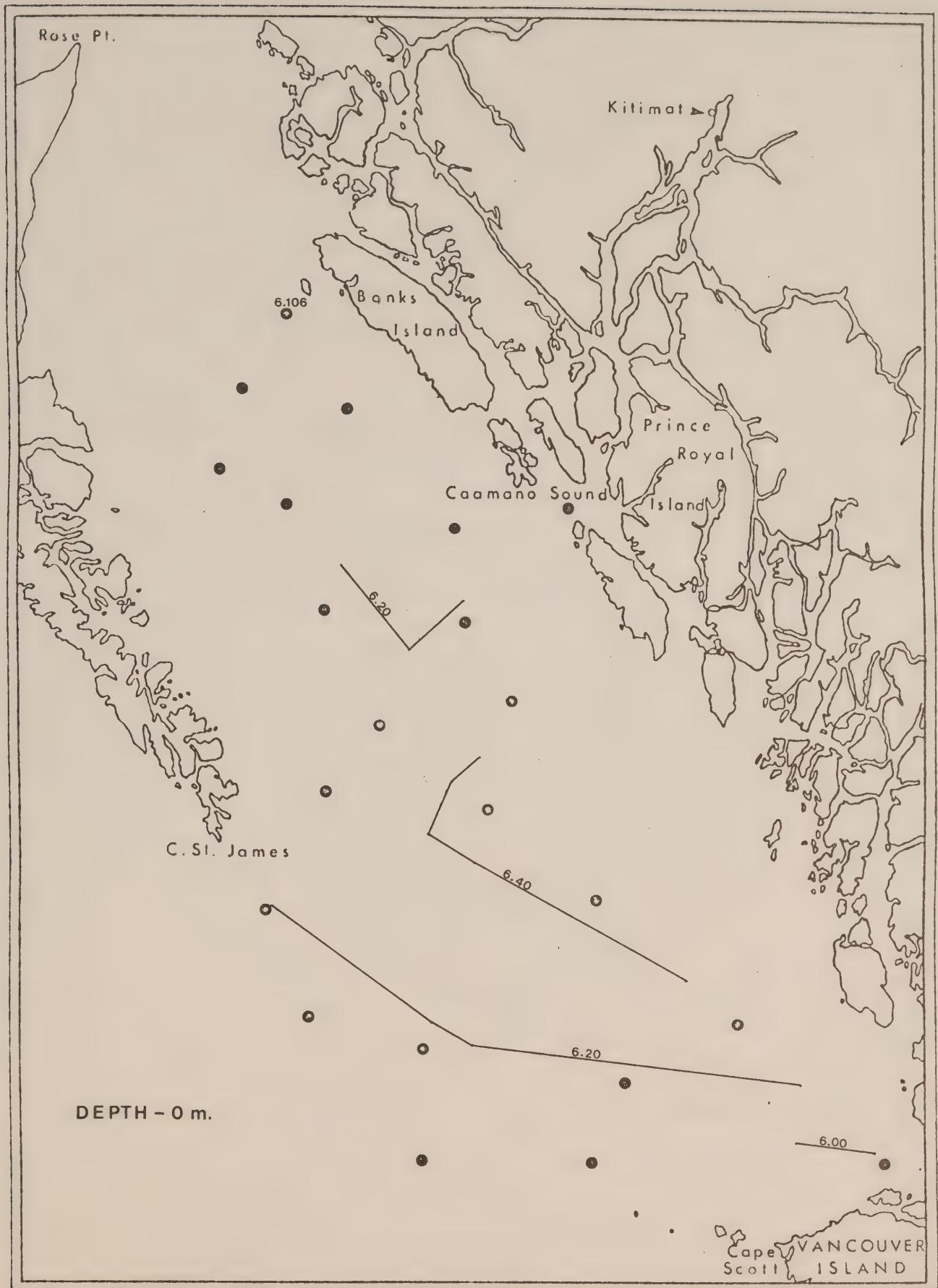


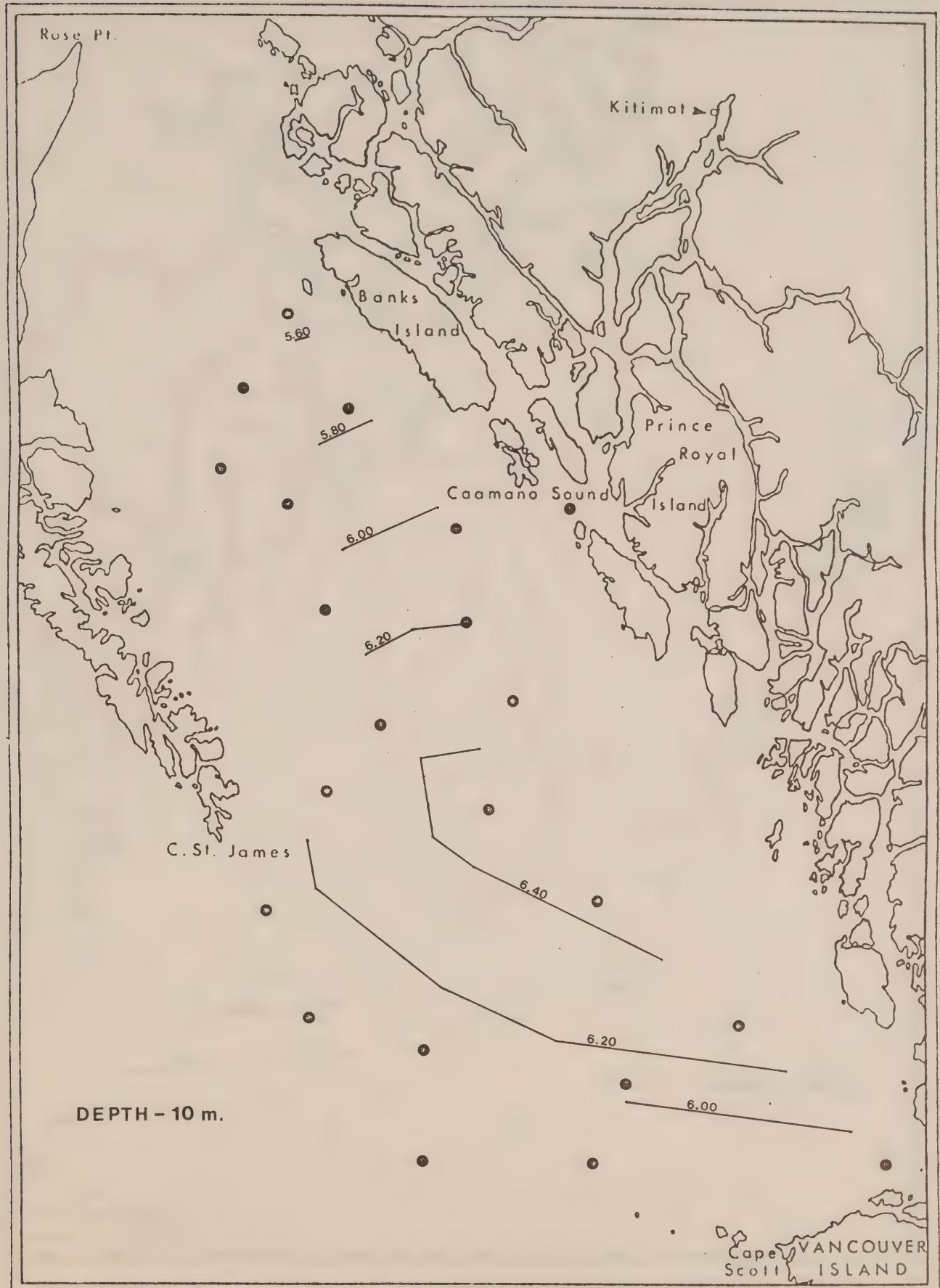


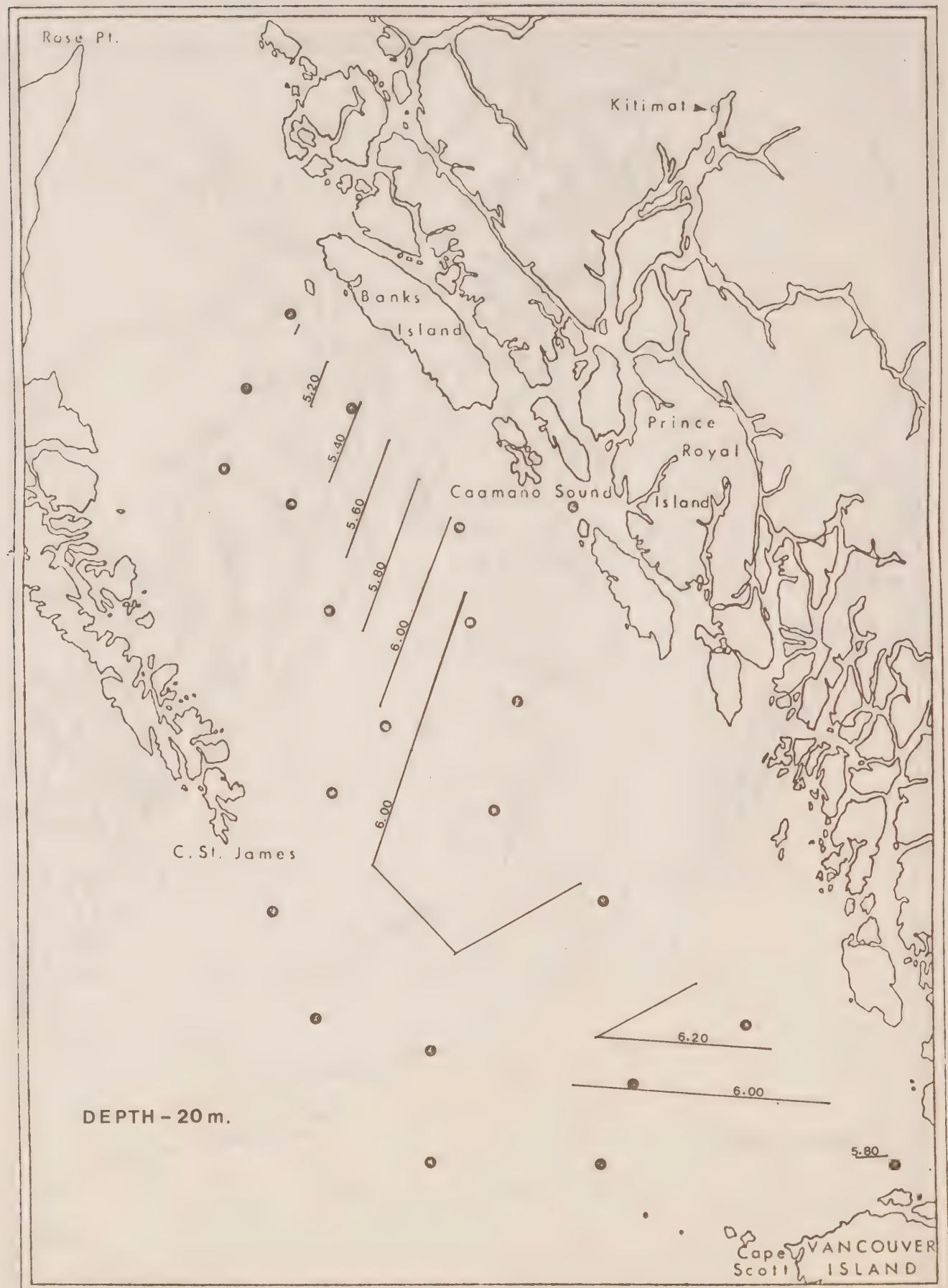


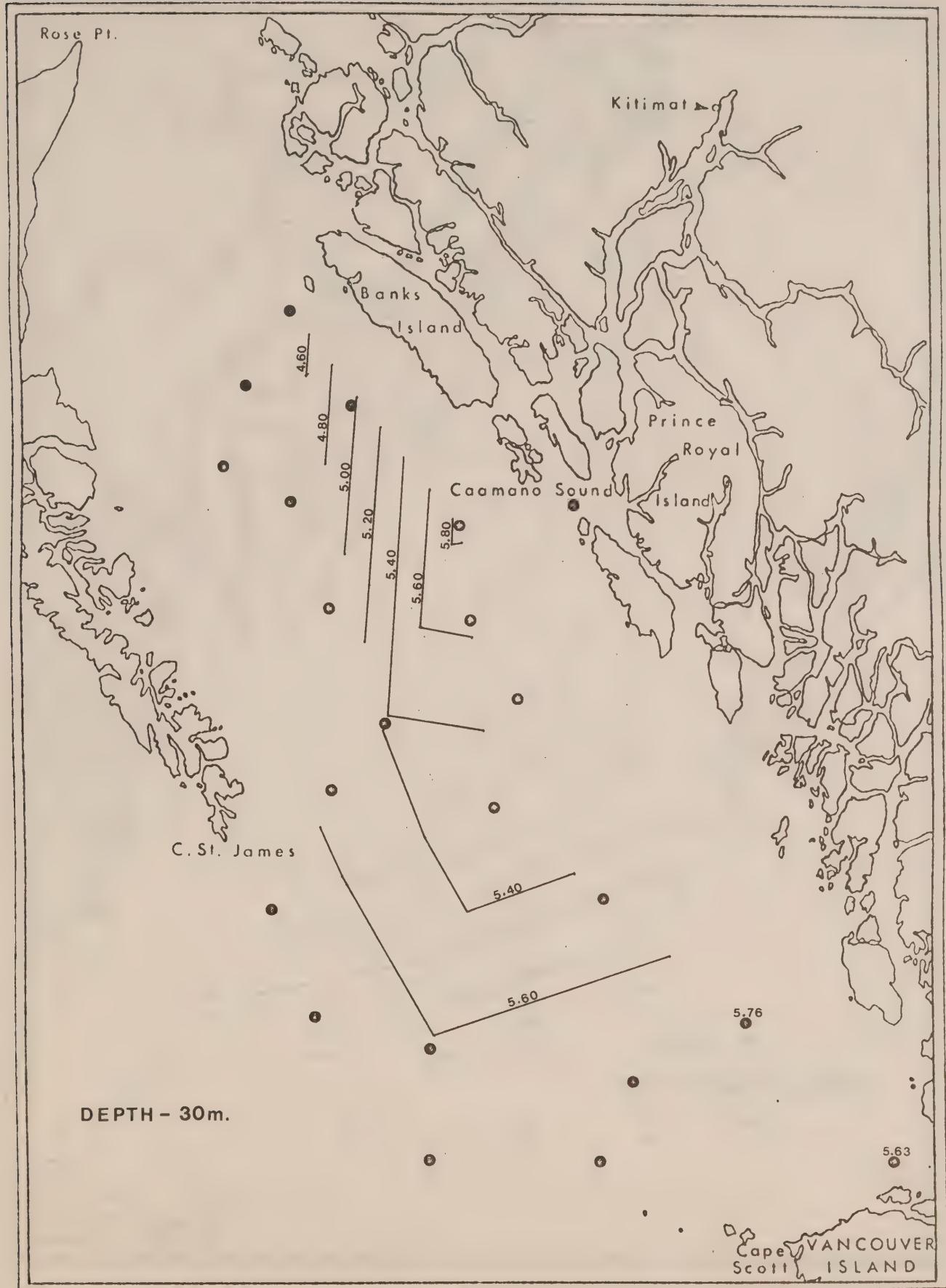


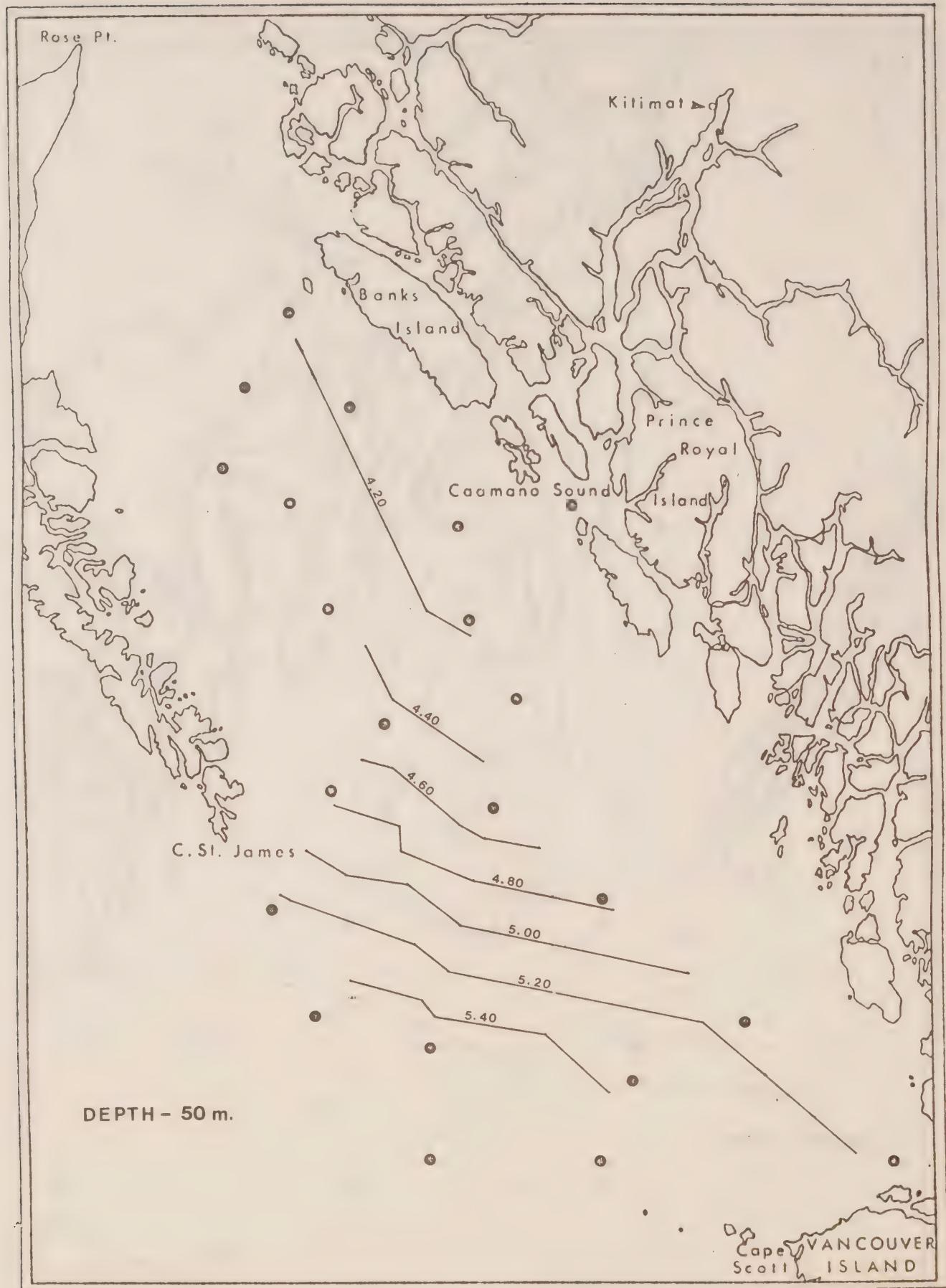
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(mL/L)

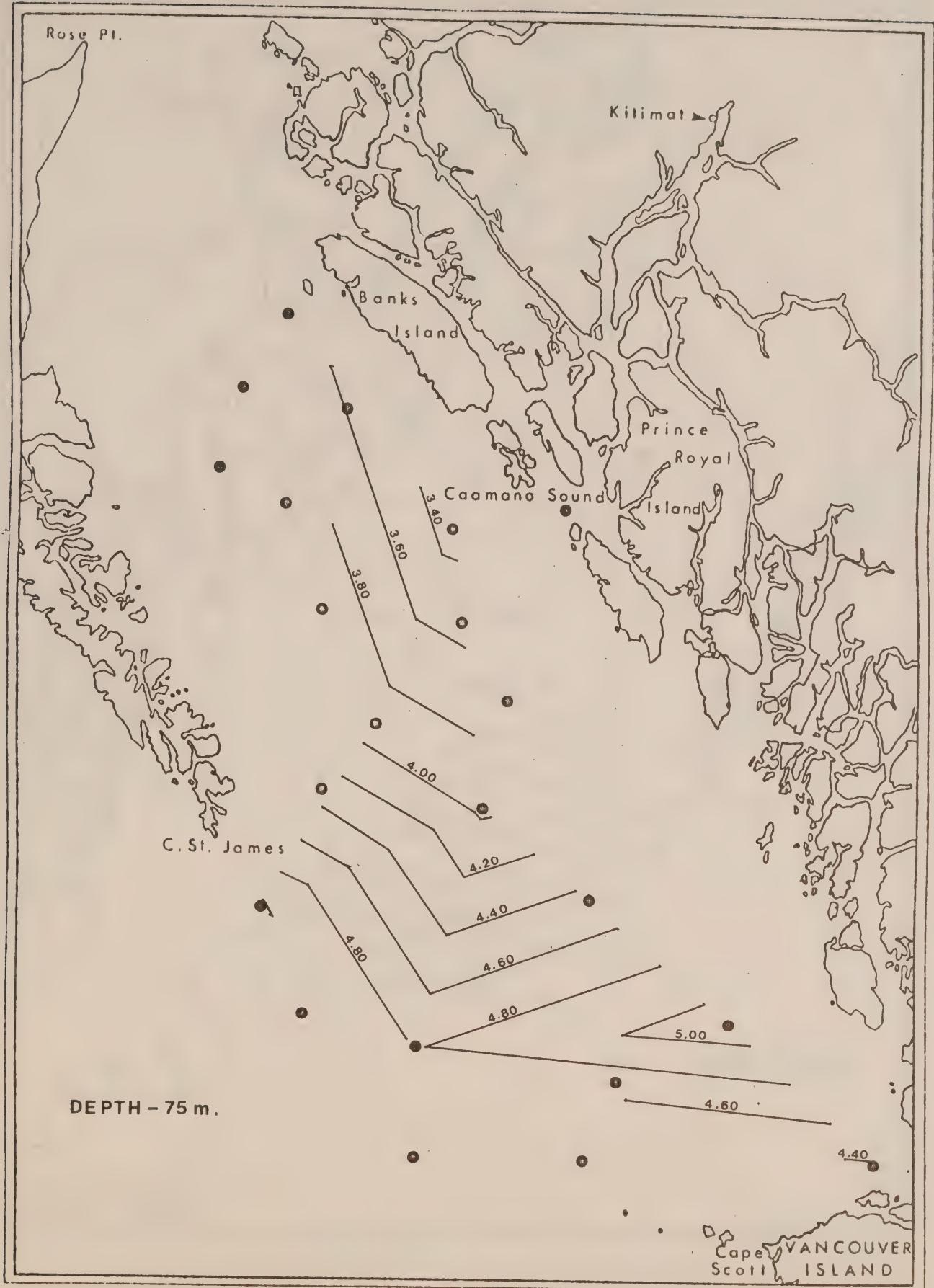




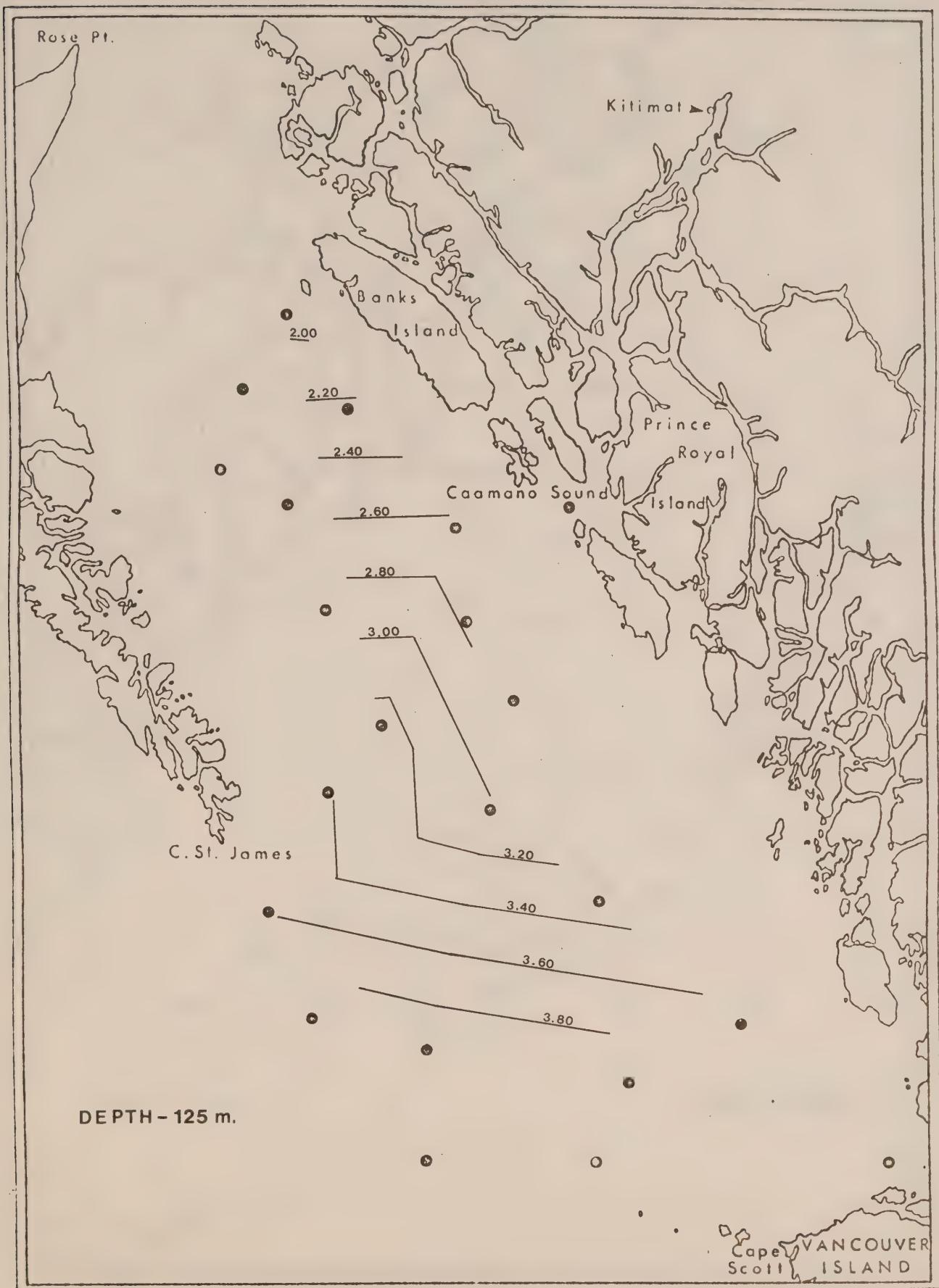


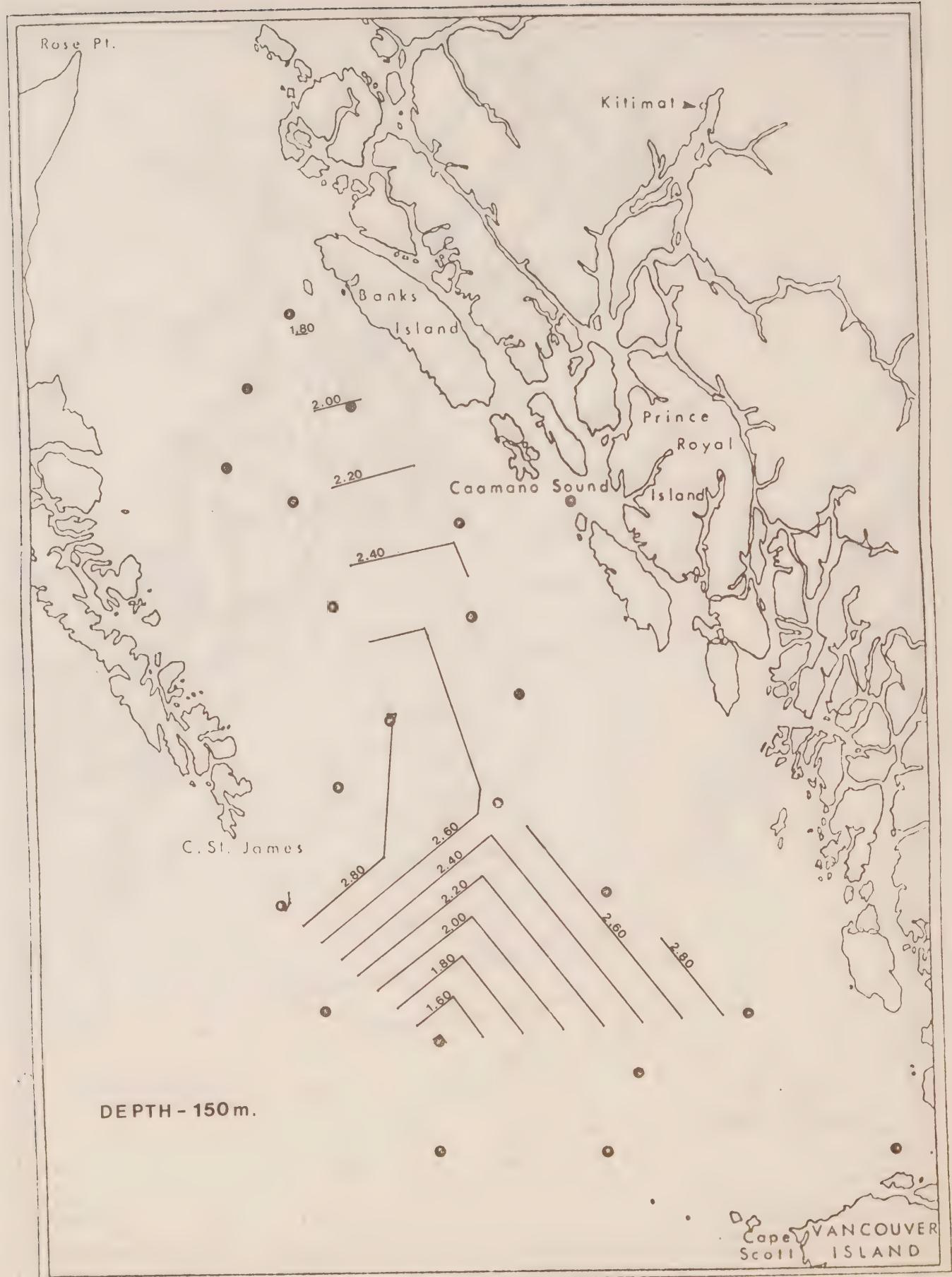


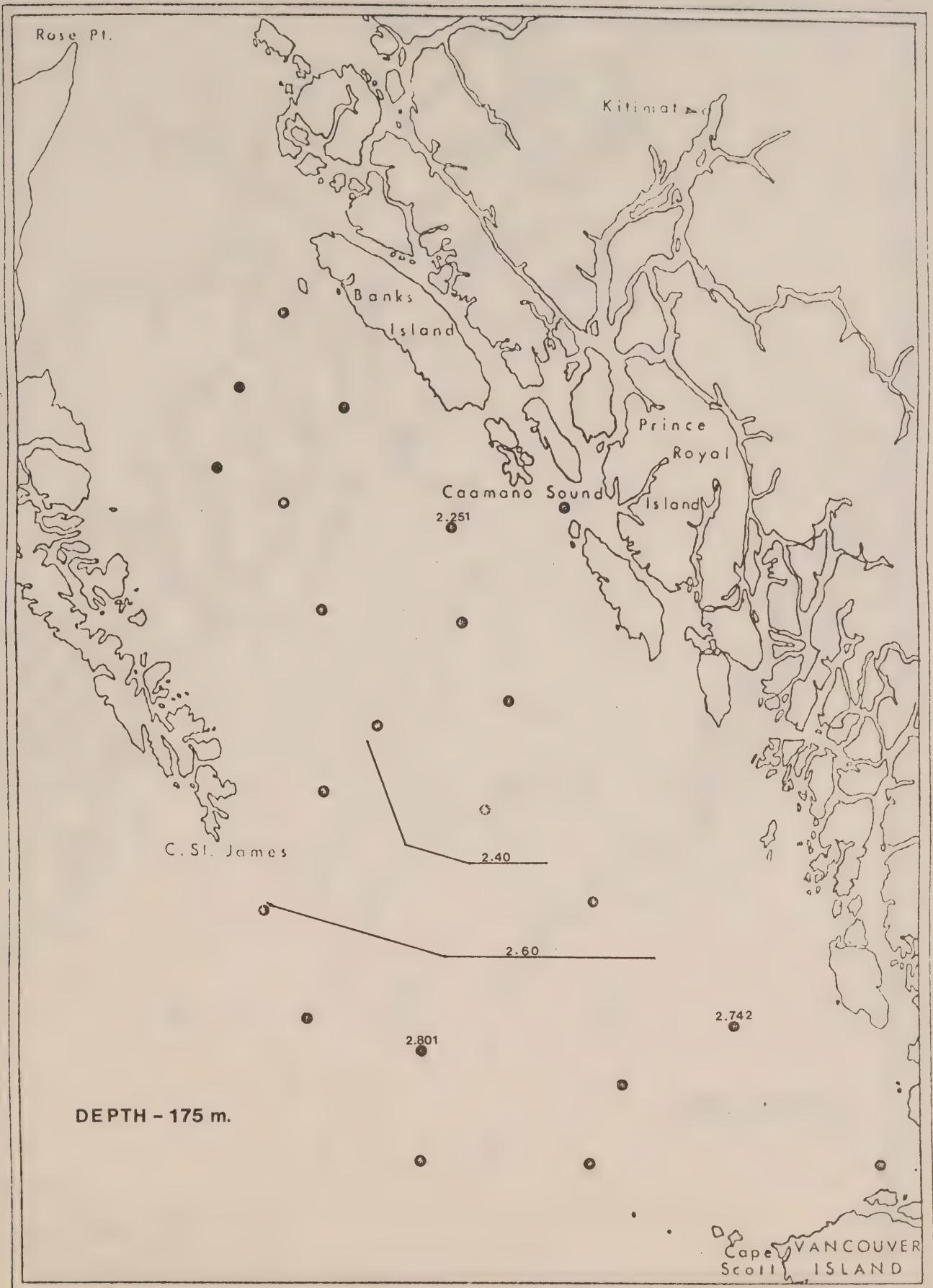


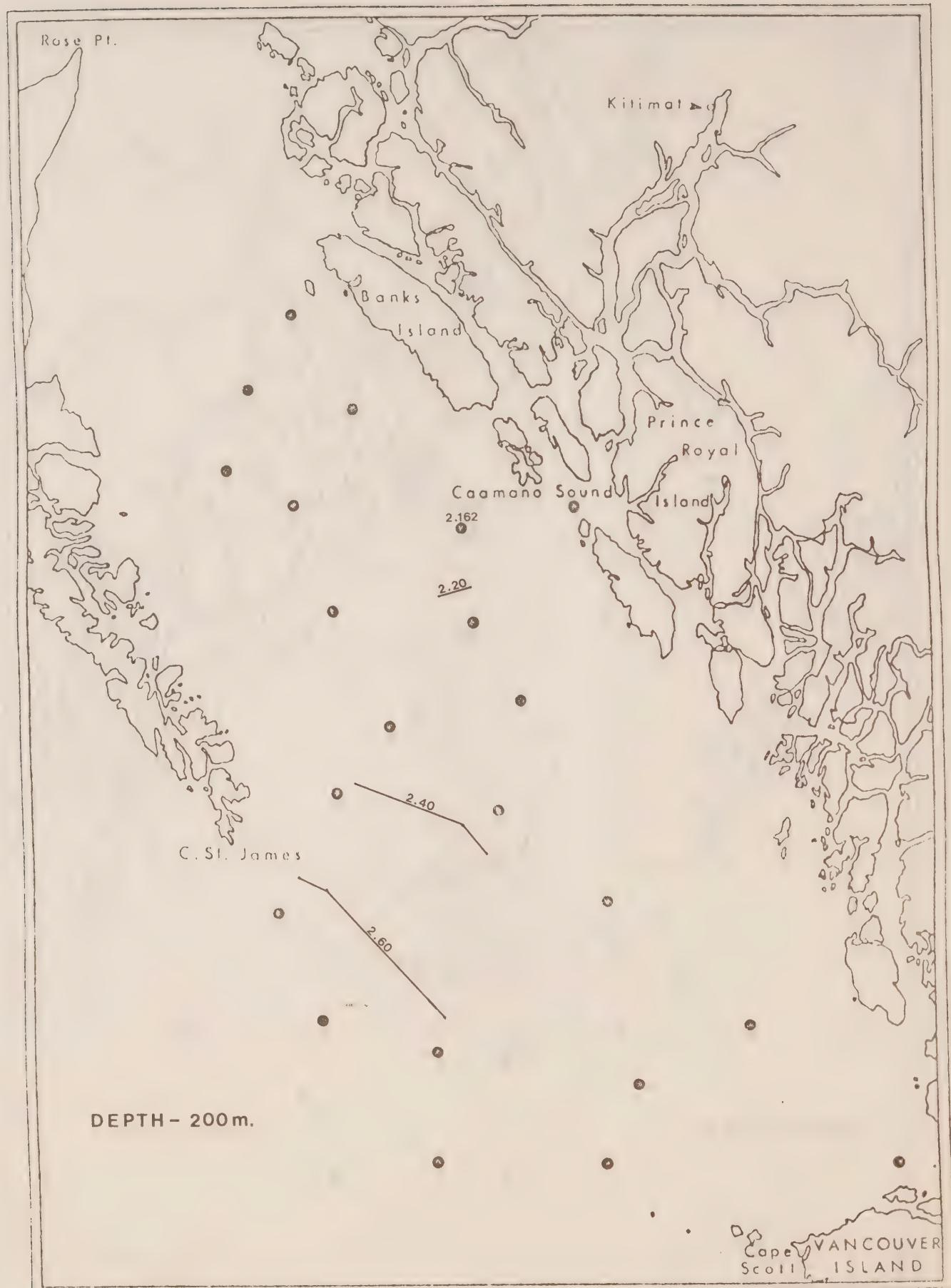


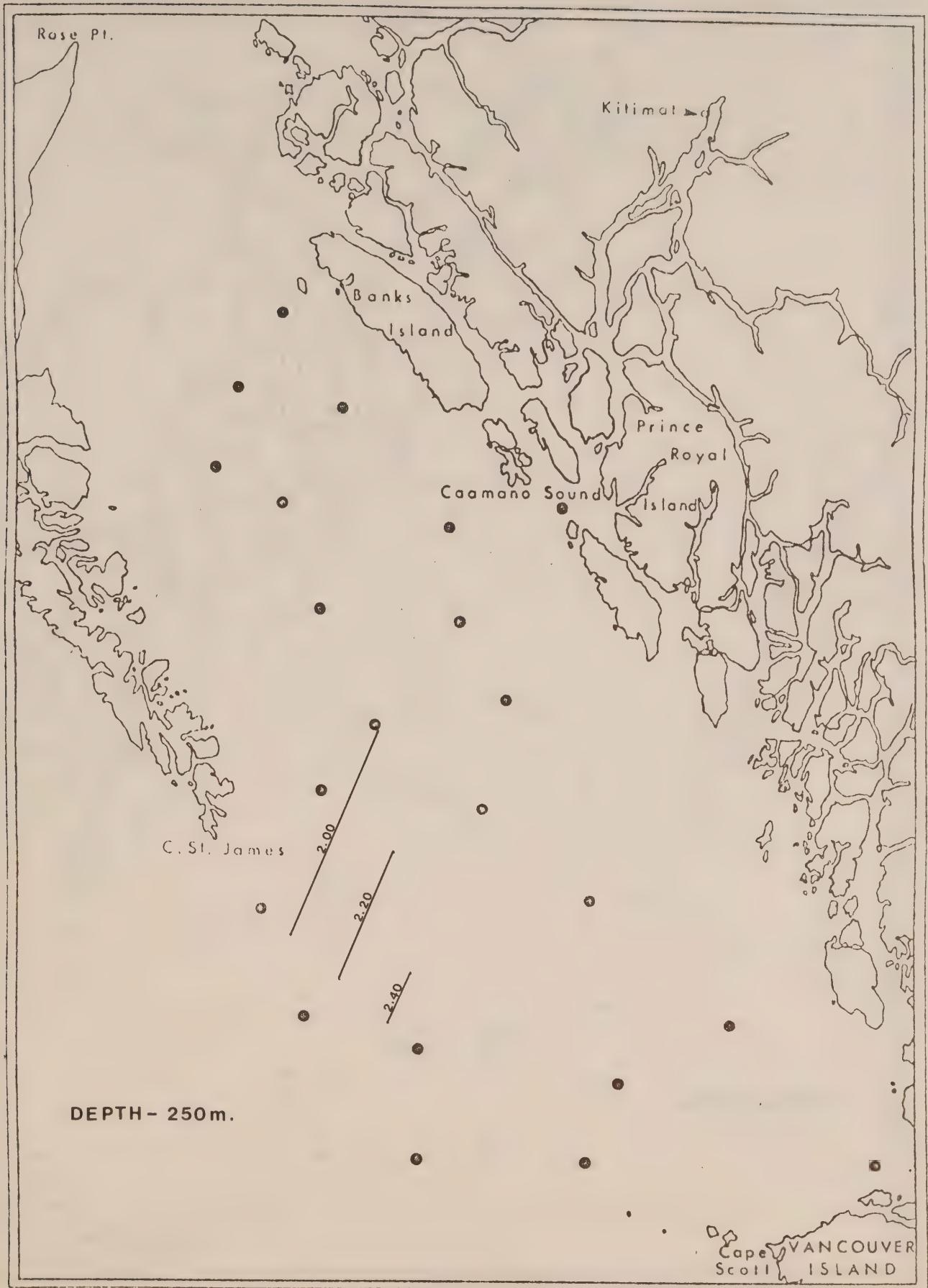


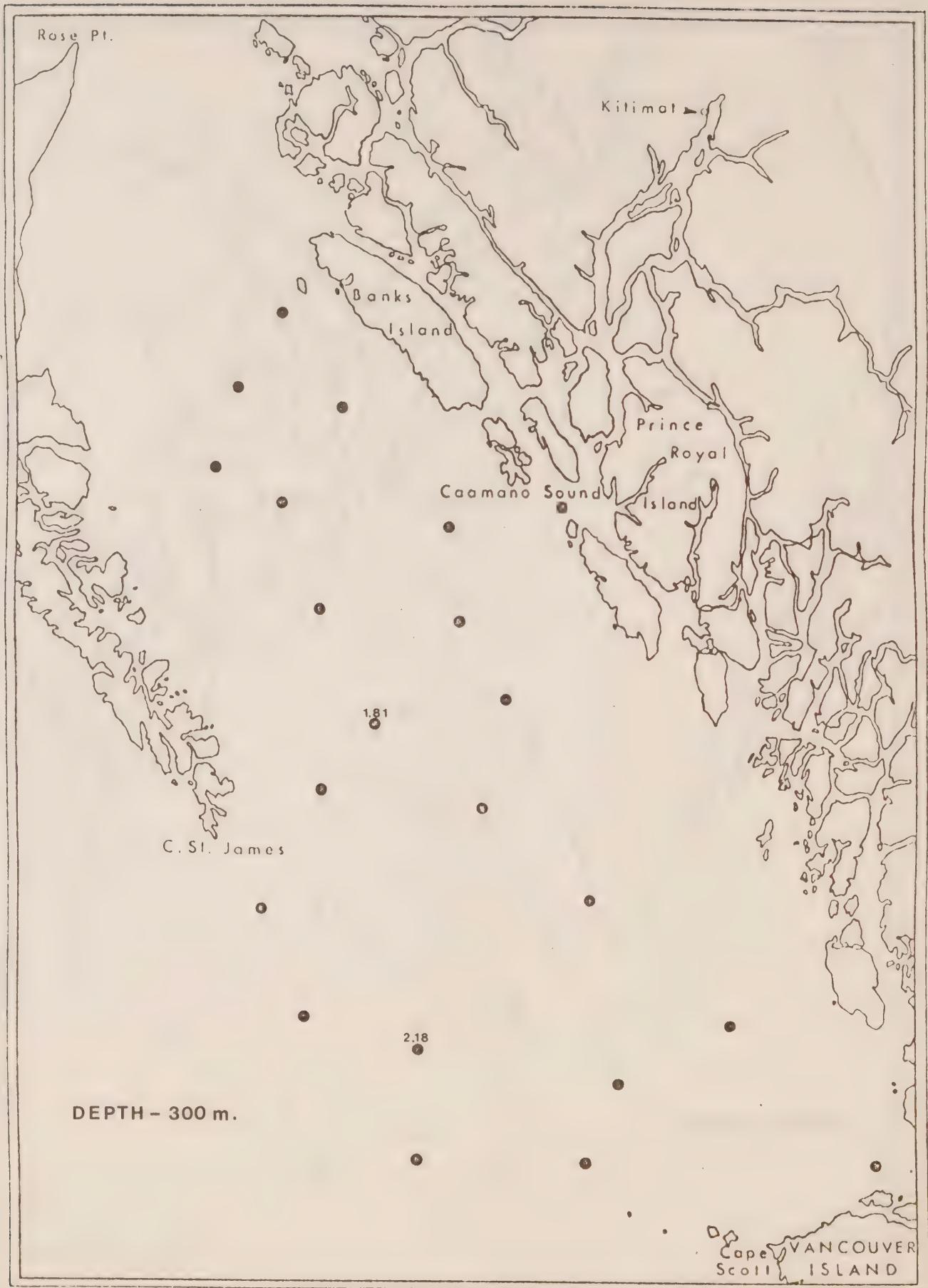


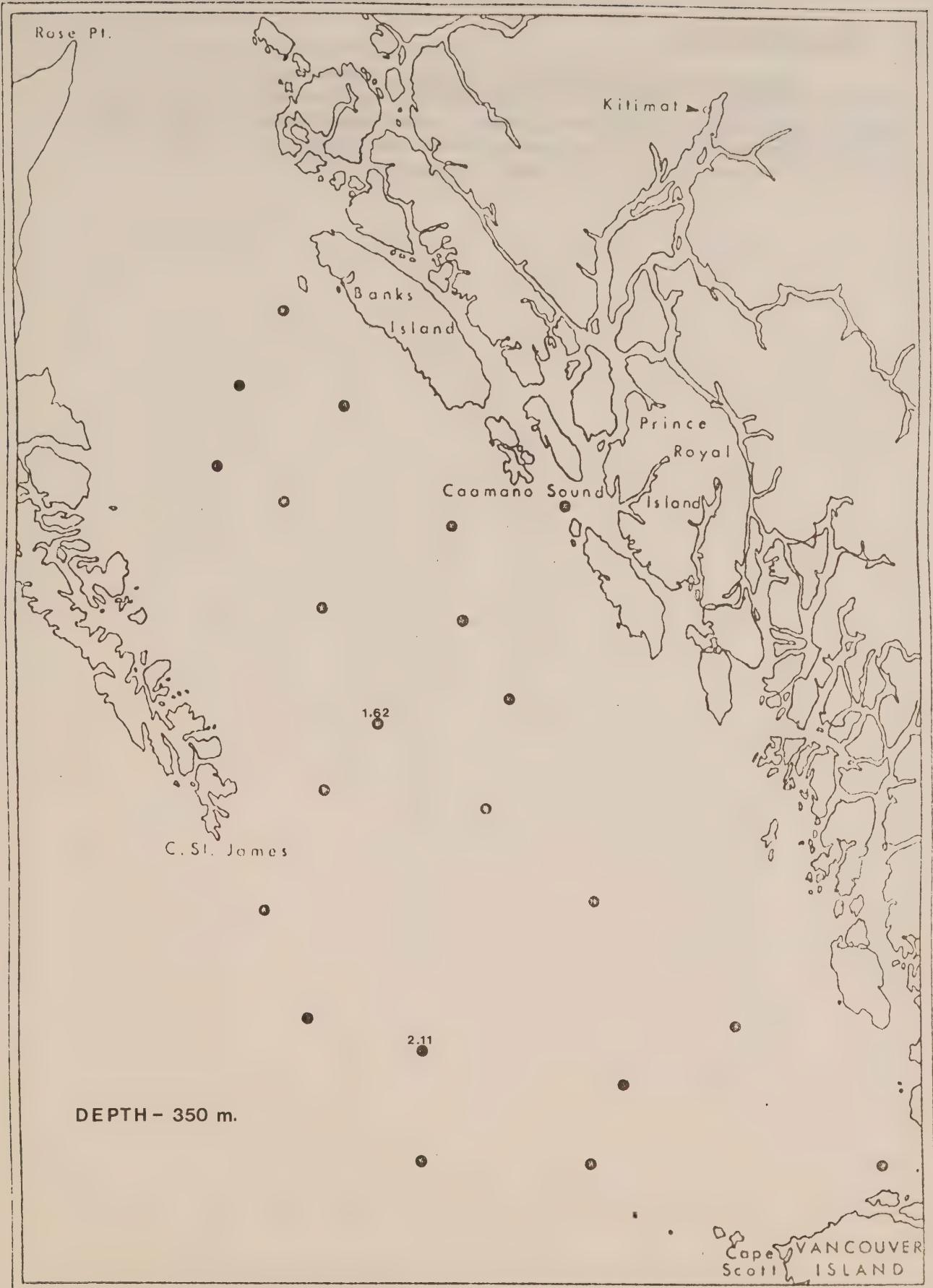












4. Time-series CTDs

Time-series CTDs consisted of casts approximately every hour at two locations: Station QD10 on 22 May 1977 for 4 hours and Station QD30 starting 20 July 1977 for 22 hours. The two following subsections present composite plots of sigma-t profiles and sequences of sigma-t profiles. Values based on 5-m depth averaged records.

4.1 Composite plots of sigma-t profiles

Plots give composite of CTD density profiles at fixed time-series locations. Start time of each group is denoted.

STN Q010 77#12 COMP AVG=5
77/5/22 02:42:06

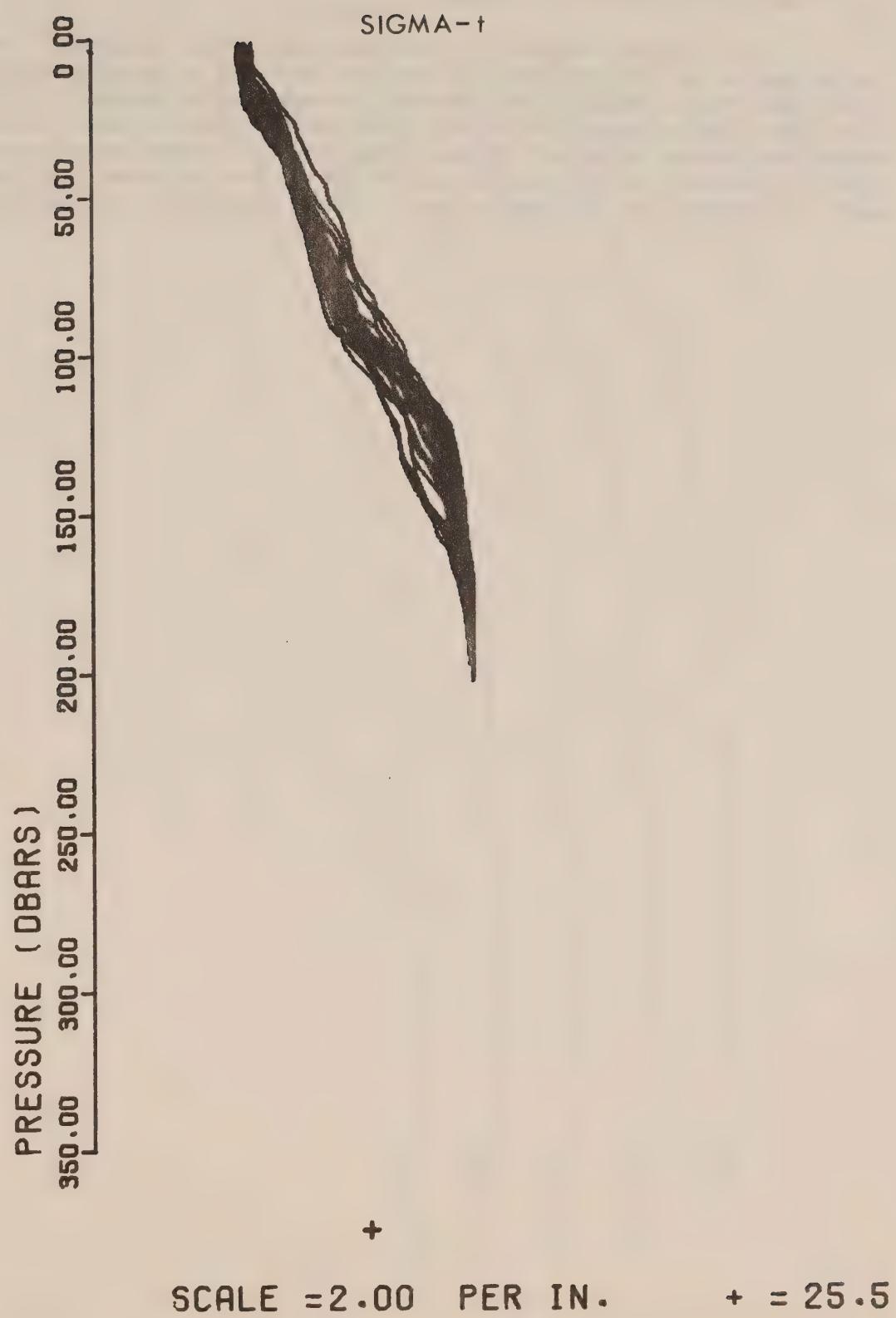
PRESSURE (DBARS)
350.00 300.00 250.00 200.00 150.00 100.00 50.00 0.00



SCALE = 2.00 PER IN.

+ = 26.0

STN QD30 77#13 COMP AVG=5M
77/ 7/20 00:09:59



4.2 Time-series profiles of sigma-t

Profiles of sigma-t for the two time-series locations. Each series begins at left and casts are offset to right by equal amounts regardless of the actual time increment between casts (typically 1 hour). Plus sign gives reference value for each profile; scale gives the unit separation between adjacent pluses. Pressure is in dbar where depth in metres = Pressure (db) - 1% of pressure (db). Cruise number and time span of observations is shown at left. Times are Pacific Standard Time.

STN QD10 CRUISE 77#12 AVG=5M

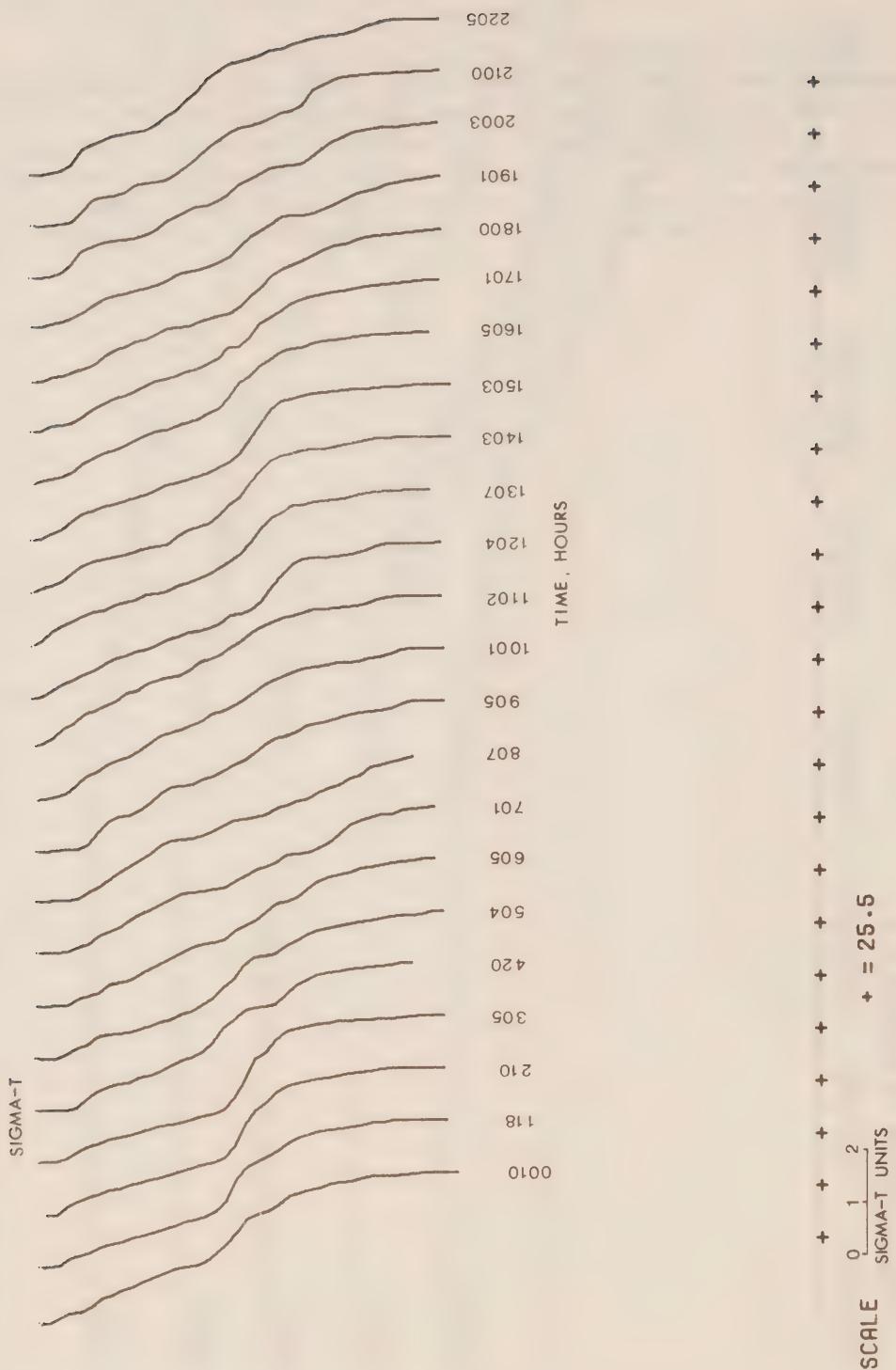
77/ 5/22 02:42:06
h min sec

PRESSURE (DBARS)
350.00 300.00 250.00 200.00 150.00 100.00 50.00 0.00

SIGMA-t

+ 0242 + 0332 + 0431 + 0535 + 0628

SCALE = 2.00 PER IN. + = 26.0



5. Acknowledgements

Many people have contributed to the collection and analysis of the oceanographic data presented here. We especially thank W.R. Crawford, C. de Jong, A. Douglas, F. Hermiston, J. Love, J. Manson, B. Minkley and M. Woodward. We also gratefully acknowledge the officers and crews of the CSS *Parizeau* and CFAV *Endeavour* for their assistance and cooperation during the numerous cruises. C. Dale, K. Holman, B. Watt and S. McKenzie are thanked for assisting in manuscript preparation.

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7. List of Figures

Figure 1. Map of Queen Charlotte Sound - Hecate Strait region showing major geographical features and bathymetry (metres).

Figure 2. Map of Queen Charlotte Sound - Hecate Strait region showing locations of CTD stations (triangles).

Figure 3. Correction curves (CTD value minus Hydro value) for CTD profiles based on Niskin bottle salinity and temperature measurements at standard depths. Dots represent mean values and horizontal bars give standard deviation about the mean. Dashed lines are best fit linear regression curves. The approximate number of observations (n) used in each calculation are as follows beginning at 0m: Cruise 77-12; 27, 27, 27, 26, 28, 25, 20, 19, 17, 15, 8, 8, 6. Cruise 77-13; 23, 24, 25, 25, 24, 24, 23, 21, 17, 18, 14, 7, 5. Cruise 77-14; 19, 21, 20, 21, 21, 20, 20, 19, 16, 16, 12, 7, 7, 4.

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DATA RECORD OF CURRENT OBSERVATIONS VOLUME XVII

QUEEN CHARLOTTE SOUND AND HEcate STRAIT

PART 2 - APPENDICES OF WATER PROPERTY OBSERVATIONS

MAY, JULY, SEPTEMBER 1977

by R.E. Thomson, W.S. Huggett and L.S.C. Kuwahara

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SIDNEY, B.C.

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DATA RECORD OF CURRENT OBSERVATIONS

VOLUME XVII

QUEEN CHARLOTTE SOUND AND HECATE STRAIT

Part 2 - Appendices of Water Property Observations

May, July, September 1977

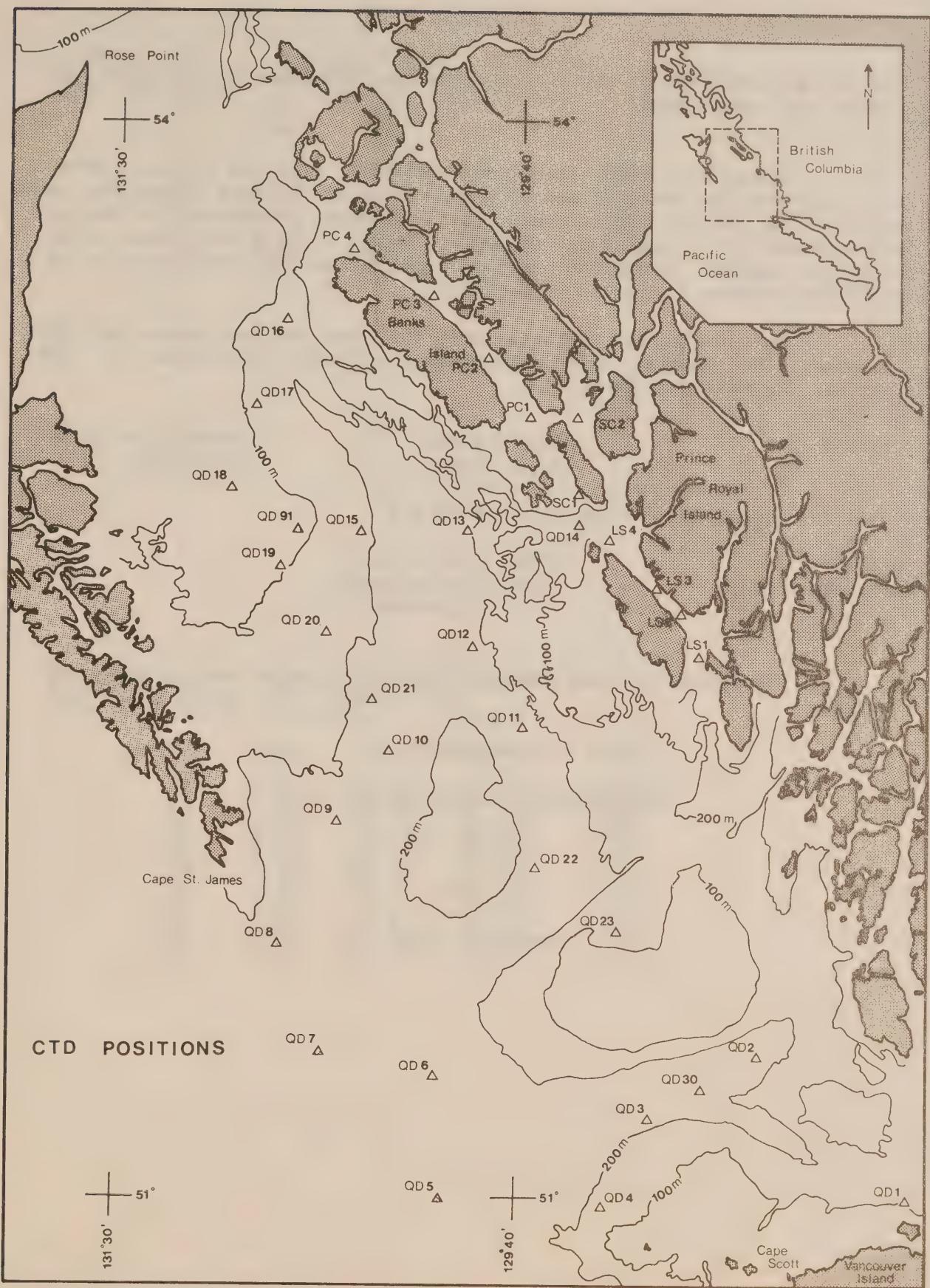
by

R.E. Thomson, W.S. Huggett and L.S.C. Kuwahara

Institute of Ocean Sciences

Sidney, B.C.

1981



APPENDIX A

Listings and profiles of physical properties: temperature, salinity, sigma-t and sound speed.

Values have been determined from hydro-corrected CTD measurements and are listed for standard depths supplemented to 25 metre increments below depths of 200 metres. Units are: depth -- metres; temperature -- degrees celsius; salinity -- parts per thousand; sigma-t -- no units; sound speed -- metres per second. Plots are based on digitized values every metre to 10 m depth and at every 5 m below 10 m depth.

For time-series stations, only the first and last casts have been included. (See Appendix B for time-series listings.) The header for each cast has the following format:

STATION ID	CRUISE NUMBER (year-number)	CONSECUTIVE NUMBER OF CTD CAST
POSITION (latitude and longitude: 00°00.0')		
DATE OF CAST (Year/month/day)	START TIME OF CAST (hour:minute:second) (Pacific Standard Time)	

The header for the temperature/salinity plots has the following format:

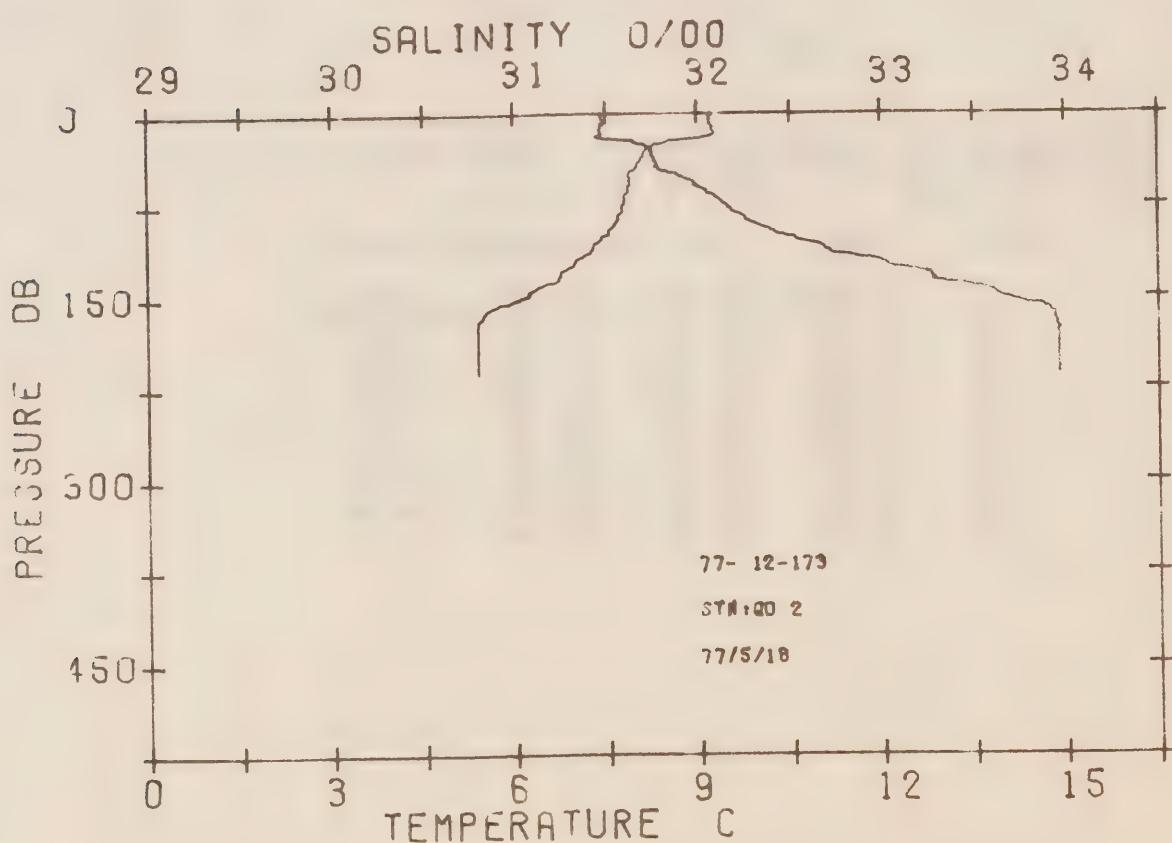
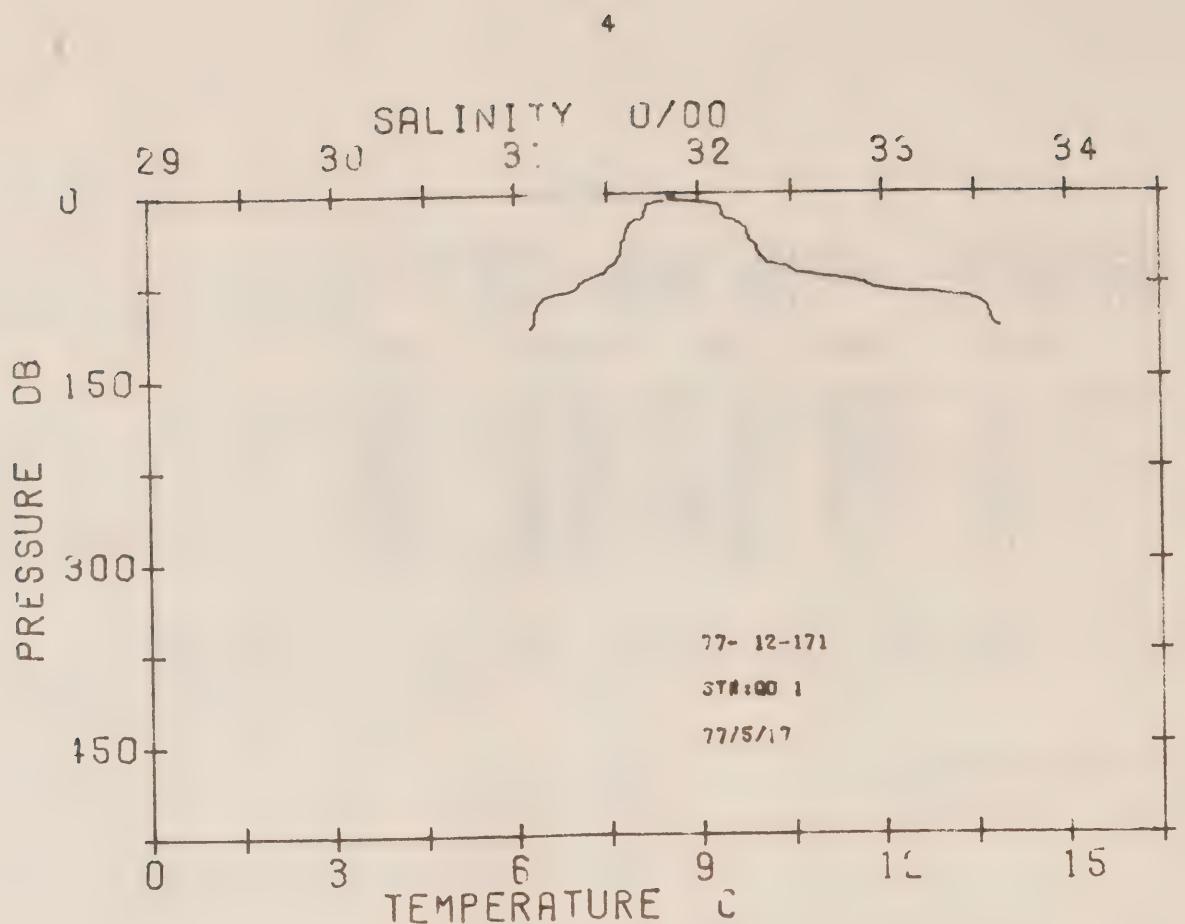
CRUISE NUMBER (year-number-CTD cast consec. No.)
STATION ID
DATE (year/month/day)

STATION QD 1 CRUISE 77-12 CONS #171
POSITION 51- . ON 127-55. OW
DATE 77/ 5/17 TIME 21:56:40 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	8. 60	31. 84	24. 73	1481.
10	8. 15	32. 11	25. 01	1480.
20	8. 09	32. 14	25. 04	1480.
30	7. 82	32. 26	25. 18	1479.
50	7. 73	32. 32	25. 24	1479.
75	7. 04	32. 91	25. 80	1478.
100	6. 32	33. 58	26. 42	1476.

STATION QD 2 CRUISE 77-12 CONS #173
POSITION 51-25. ON 128-35. OW
DATE 77/ 5/18 TIME 1:26:41 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 22	31. 47	24. 35	1483.
10	9. 20	31. 48	24. 36	1483.
20	9. 17	31. 44	24. 34	1483.
30	8. 15	31. 75	24. 73	1480.
50	7. 86	31. 89	24. 88	1479.
75	7. 78	32. 15	25. 10	1480.
100	7. 52	32. 47	25. 38	1479.
125	6. 96	33. 05	25. 92	1478.
150	6. 21	33. 66	26. 49	1477.
175	5. 39	33. 96	26. 83	1474.
200	5. 39	33. 97	26. 84	1474.

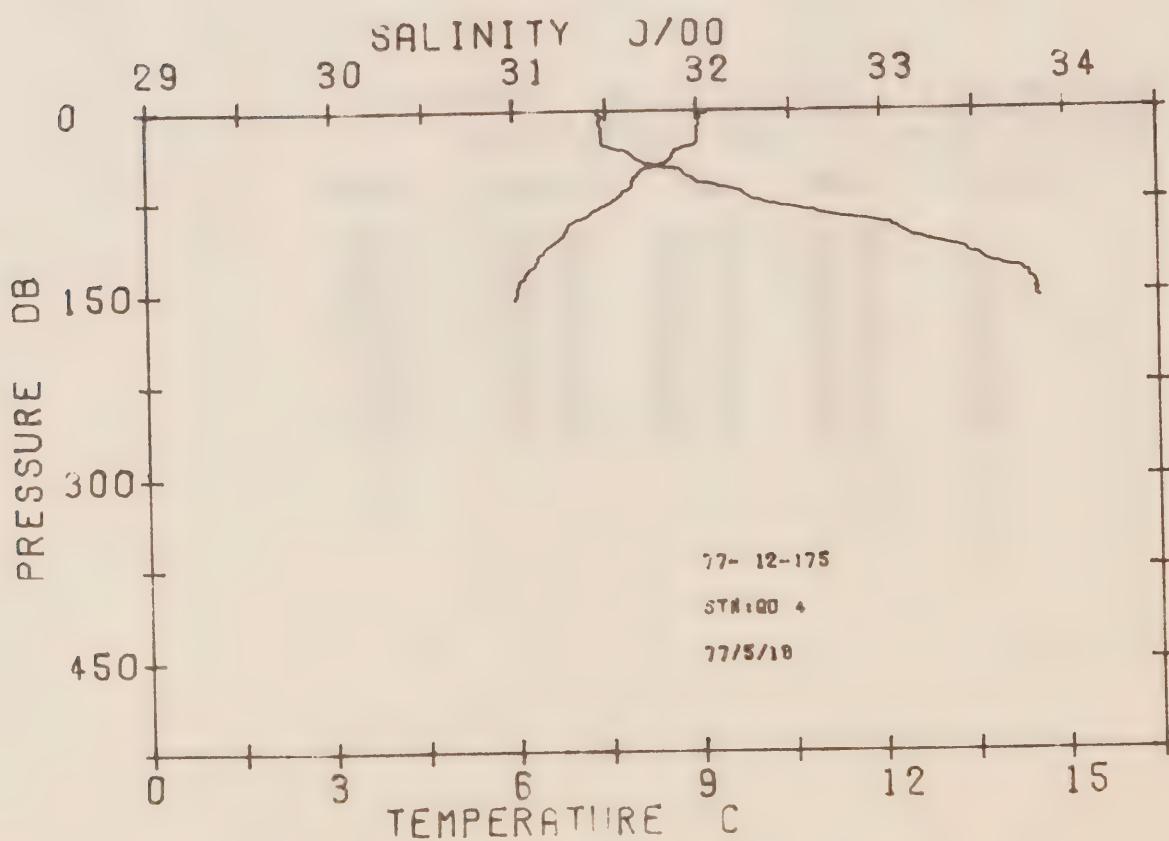
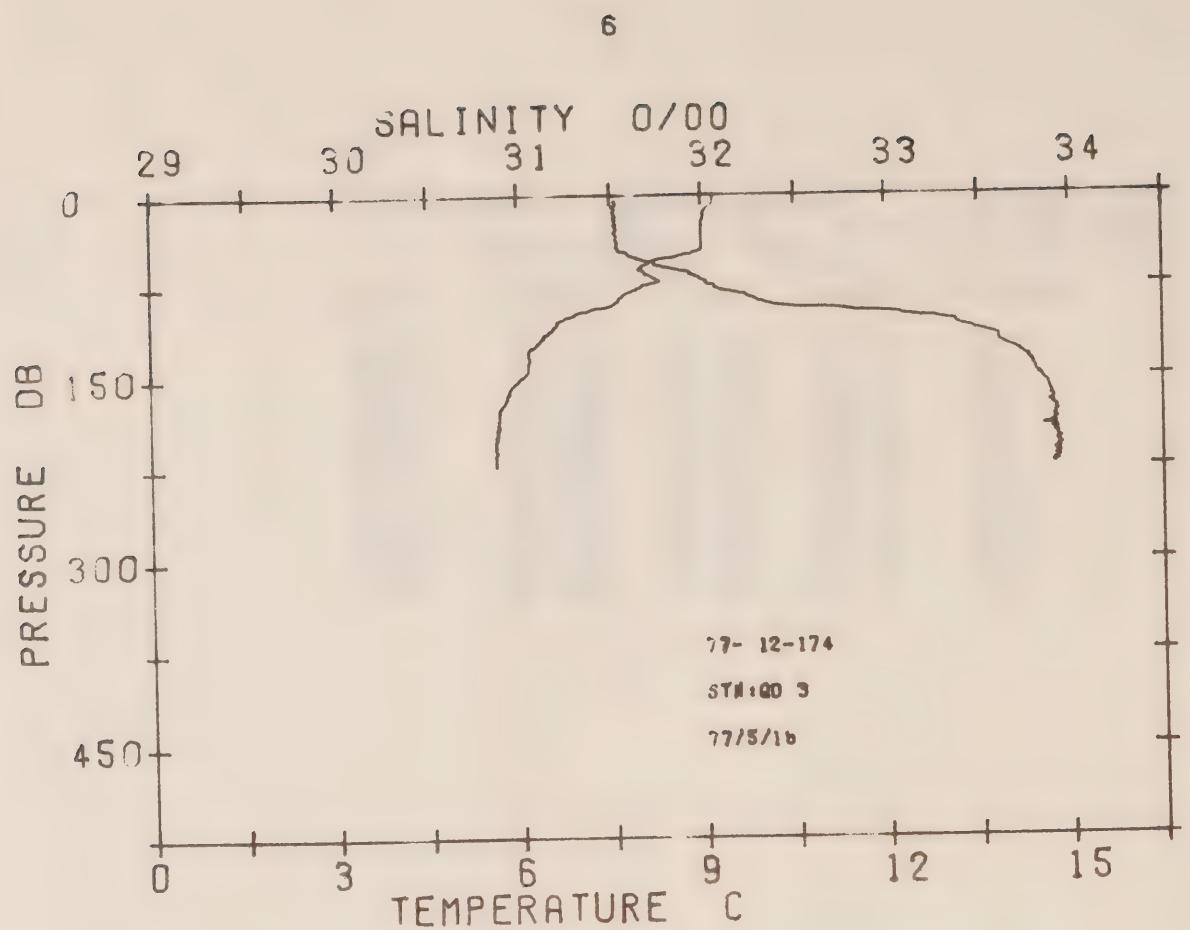


STATION QD 3 CRUISE 77-12 CONS #174
 POSITION 51-14. ON 129- 5. 8W
 DATE 77/ 5/18 TIME 4:25:23 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 18	31. 43	24. 32	1483.
10	9. 12	31. 52	24. 40	1483.
20	9. 01	31. 53	24. 43	1483.
30	9. 00	31. 53	24. 43	1483.
50	8. 72	31. 60	24. 52	1482.
75	8. 02	32. 07	25. 00	1480.
100	6. 88	33. 13	25. 99	1478.
125	6. 24	33. 66	26. 49	1476.
150	6. 06	33. 83	26. 65	1476.
175	5. 70	33. 92	26. 76	1475.
200	5. 63	33. 93	26. 78	1475.

STATION QD 4 CRUISE 77-12 CONS #175
 POSITION 51- . ON 129-17. 0W
 DATE 77/ 5/18 TIME 10: 9:17 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 16	31. 47	24. 36	1483.
10	9. 03	31. 46	24. 37	1482.
20	8. 99	31. 48	24. 39	1482.
30	8. 89	31. 50	24. 43	1482.
50	8. 08	31. 91	24. 87	1480.
75	7. 60	32. 34	25. 27	1479.
100	6. 81	33. 12	25. 99	1477.
125	6. 34	33. 59	26. 42	1477.
150	6. 02	33. 85	26. 66	1476.

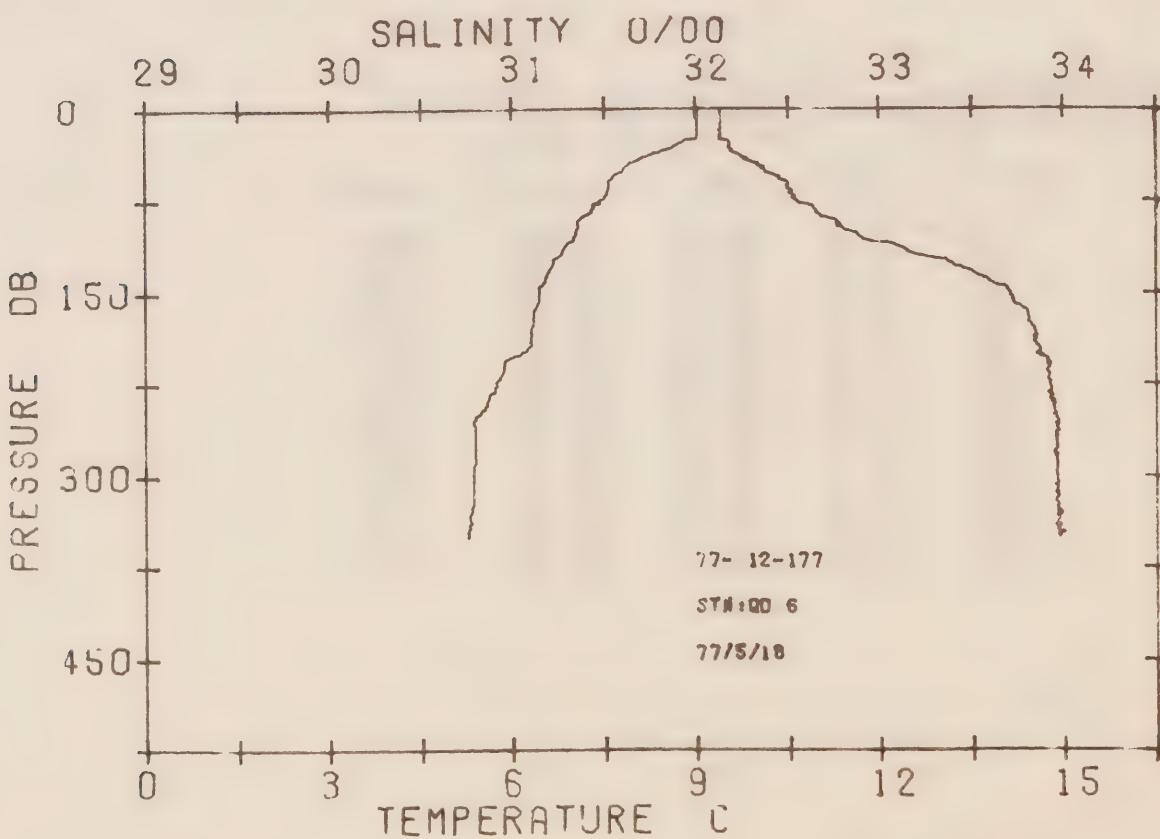
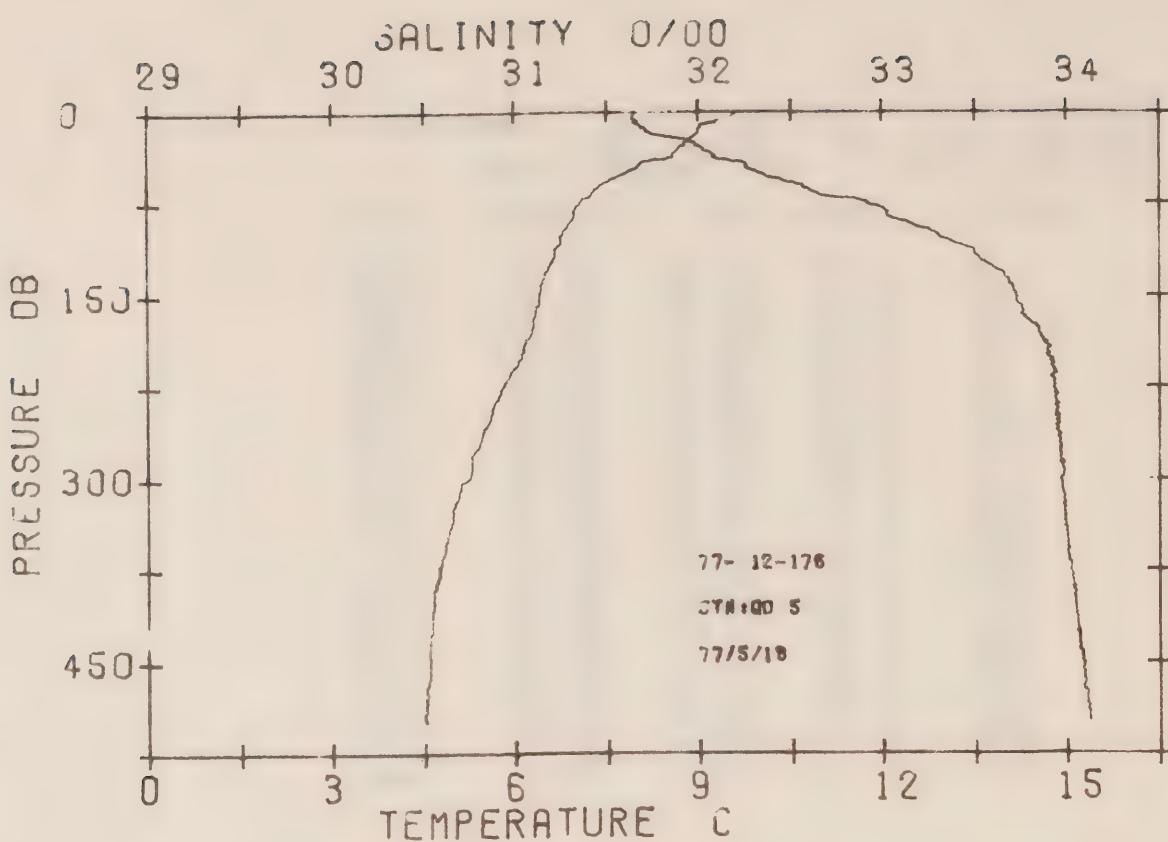


STATION QD 5 CRUISE 77-12 CONS #176
 POSITION 51- . ON 130- 5.0W
 DATE 77/ 5/18 TIME 12:42:41 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.59	31.65	24.43	1485.
10	9.14	31.64	24.49	1483.
20	8.97	31.76	24.61	1483.
30	8.69	32.02	24.86	1482.
50	7.87	32.31	25.21	1480.
75	7.06	32.92	25.80	1478.
100	6.78	33.30	26.13	1478.
125	6.58	33.58	26.38	1478.
150	6.42	33.73	26.52	1478.
175	6.31	33.83	26.61	1478.
200	6.12	33.91	26.70	1477.
225	5.81	33.95	26.77	1477.
250	5.61	33.95	26.79	1476.
275	5.41	33.97	26.83	1476.
300	5.26	33.98	26.86	1476.
400	4.67	34.05	26.98	1475.
500	4.52	34.12	27.06	1476.
600	4.24	34.21	27.16	1477.
700	3.98	34.28	27.24	1477.
800	3.70	34.34	27.31	1478.
900	3.61	34.36	27.34	1479.
1000	3.43	34.40	27.39	1480.

STATION QD 6 CRUISE 77-12 CONS #177
 POSITION 51-22.7N 130- 3.0W
 DATE 77/ 5/18 TIME 23:19:14 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.02	32.13	24.90	1483.
10	9.03	32.14	24.90	1483.
20	9.02	32.14	24.90	1483.
30	8.67	32.18	24.99	1482.
50	7.81	32.36	25.26	1480.
75	7.44	32.55	25.45	1479.
100	7.04	32.84	25.74	1478.
125	6.66	33.37	26.21	1478.
150	6.43	33.70	26.49	1478.
175	6.34	33.81	26.60	1478.
200	6.16	33.87	26.67	1477.
225	5.75	33.93	26.76	1476.
250	5.45	33.96	26.83	1476.
275	5.39	33.97	26.84	1476.
300	5.37	33.96	26.84	1476.

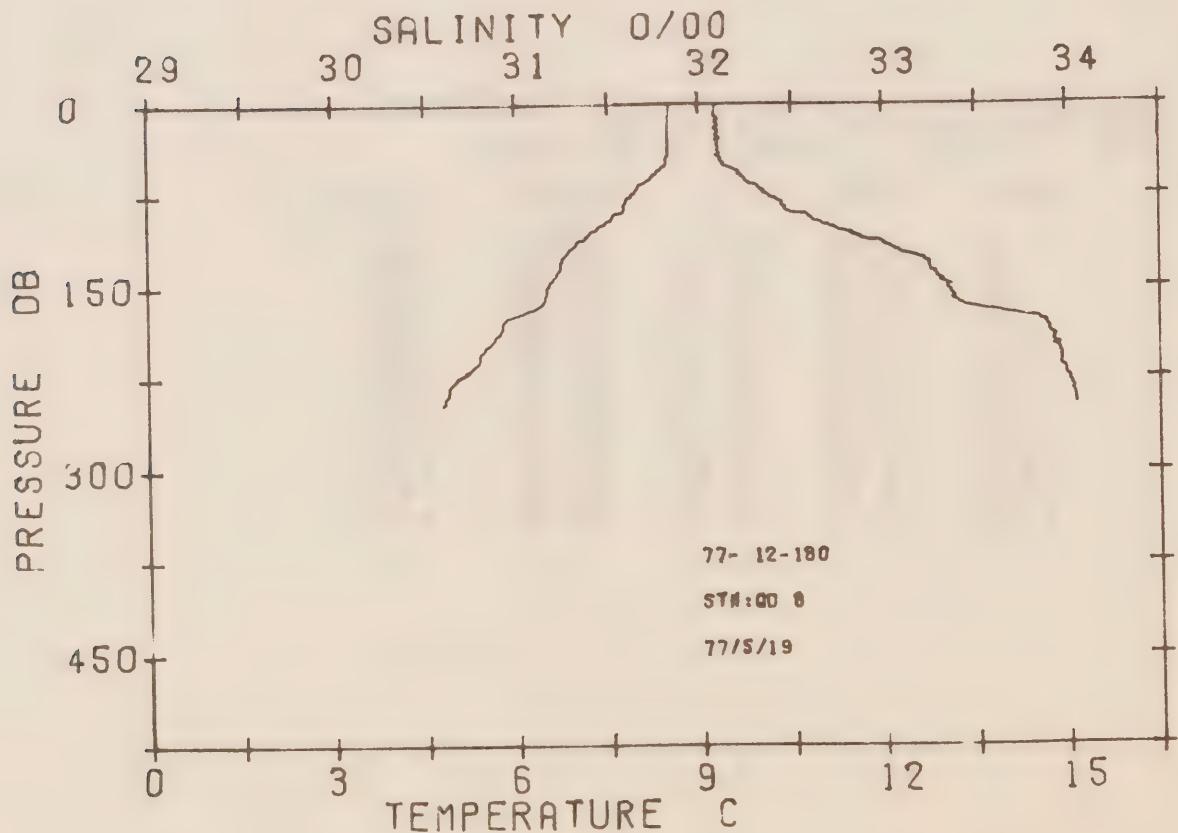
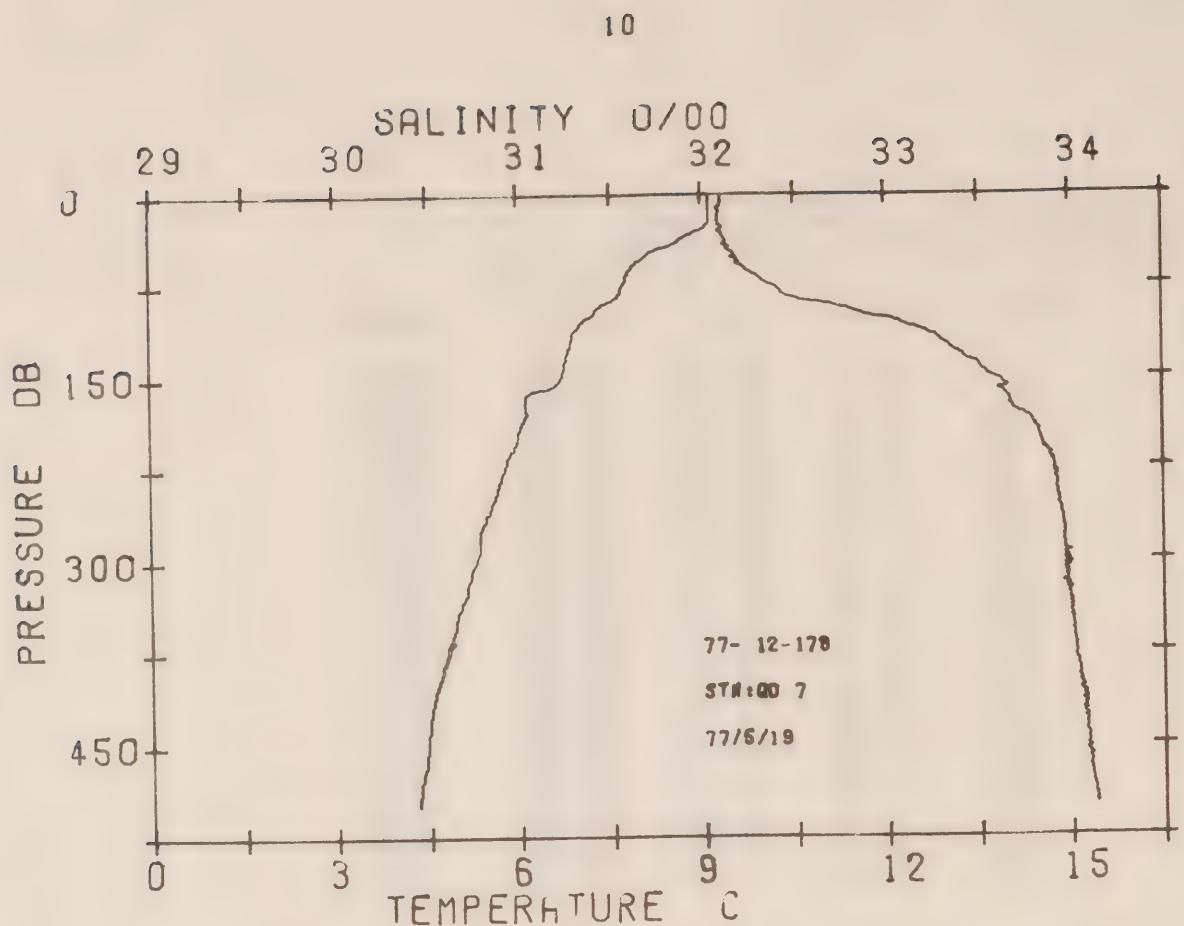


STATION QD 7 CRUISE 77-12 CONS #178
 POSITION 51-25. ON 130-34.5W
 DATE 77/ 5/19 TIME 1:10:52 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.11	32.11	24.86	1483.
10	9.11	32.10	24.86	1484.
20	9.11	32.09	24.85	1484.
30	8.97	32.10	24.88	1483.
50	8.10	32.18	25.07	1480.
75	7.70	32.39	25.29	1480.
100	7.19	32.92	25.78	1479.
125	6.84	33.36	26.17	1478.
150	6.70	33.59	26.37	1478.
175	6.12	33.69	26.53	1477.
200	5.99	33.84	26.66	1477.
225	5.77	33.92	26.75	1476.
250	5.59	33.94	26.79	1476.
275	5.38	33.97	26.84	1476.
300	5.29	34.00	26.87	1476.
400	4.66	34.05	26.99	1475.
500	4.32	34.13	27.09	1475.
600	4.14	34.20	27.16	1476.
700	3.92	34.28	27.25	1477.
800	3.73	34.31	27.29	1478.
900	3.52	34.36	27.35	1479.
1000	3.25	34.42	27.42	1479.

STATION QD 8 CRUISE 77-12 CONS #180
 POSITION 51-44.5N 130-47.0W
 DATE 77/ 5/19 TIME 5:19: 9 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	8.48	32.10	24.95	1481.
10	8.50	32.08	24.93	1481.
20	8.49	32.09	24.95	1481.
30	8.49	32.10	24.95	1482.
50	8.45	32.13	24.98	1482.
75	7.90	32.37	25.25	1480.
100	7.40	32.70	25.58	1479.
125	6.78	33.18	26.04	1478.
150	6.52	33.35	26.21	1477.
175	5.88	33.83	26.67	1476.
200	5.47	33.96	26.82	1475.
225	5.02	34.02	26.92	1473.

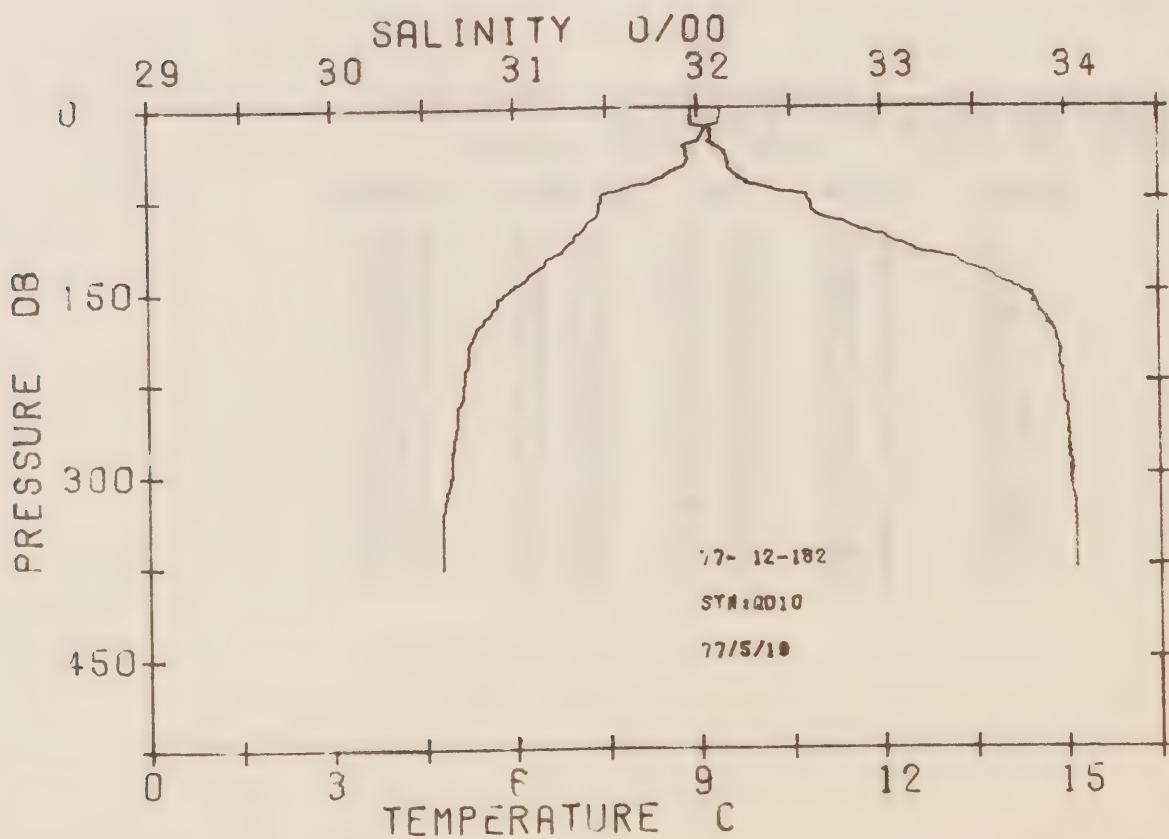
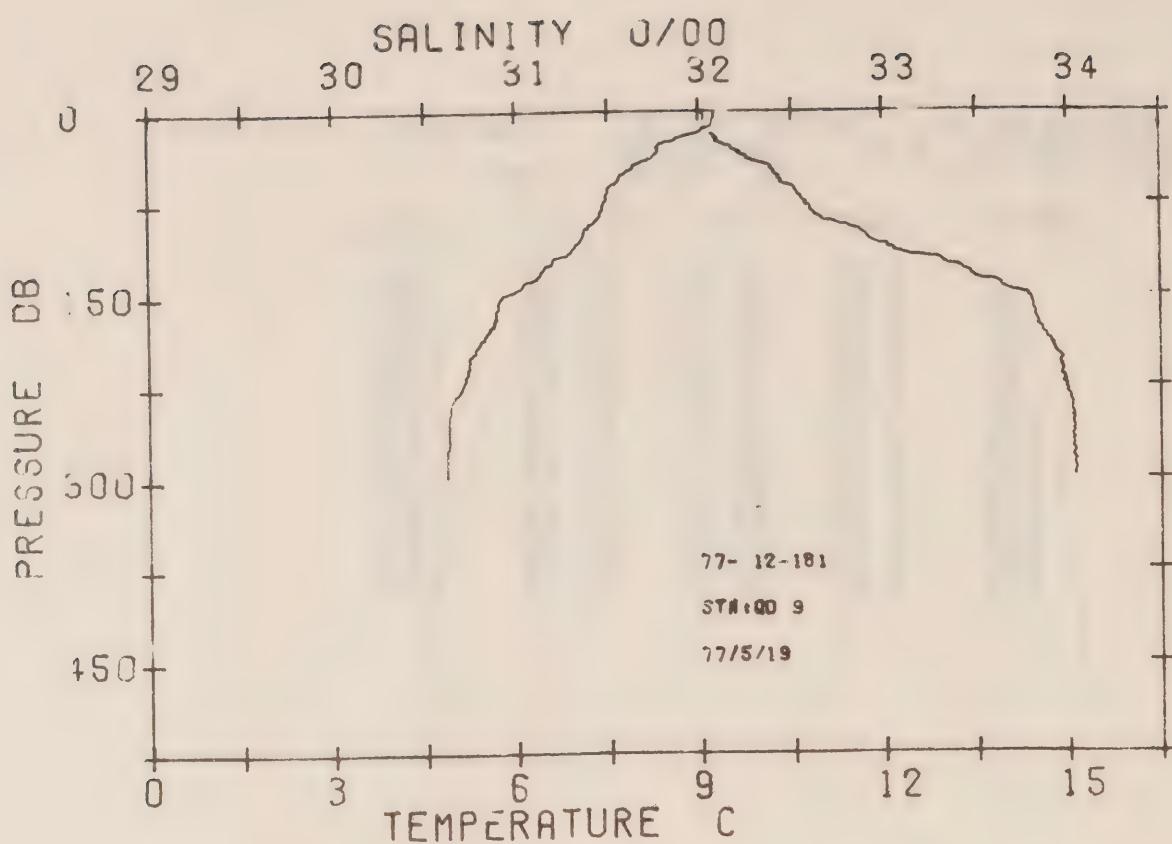


STATION QD 9 CRUISE 77-12 CONS #181
 POSITION 52° 4' ON 130° 31' OW
 DATE 77/ 5/19 TIME 10:15:17 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9.25	32.02	24.78	1484.
10	9.22	32.03	24.78	1484.
20	8.85	32.08	24.88	1483.
30	8.32	32.17	25.03	1481.
50	7.83	32.41	25.29	1480.
75	7.43	32.58	25.48	1479.
100	7.11	32.90	25.77	1478.
125	6.59	33.33	26.19	1477.
150	5.82	33.78	26.64	1475.
175	5.63	33.85	26.71	1475.
200	5.26	33.96	26.84	1474.
225	5.10	34.00	26.90	1474.
250	4.90	34.03	26.94	1473.
275	4.88	34.03	26.95	1474.

STATION QD10 CRUISE 77-12 CONS #182
 POSITION 52° 16.5' N 130° 16.0' W
 DATE 77/ 5/19 TIME 11:49:31 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.36	31.97	24.72	1484.
10	9.35	31.96	24.71	1484.
20	9.08	32.08	24.85	1484.
30	8.83	32.09	24.90	1483.
50	8.73	32.17	24.97	1483.
75	7.42	32.59	25.49	1479.
100	7.13	32.88	25.76	1478.
125	6.51	33.42	26.27	1477.
150	5.91	33.75	26.60	1476.
175	5.48	33.89	26.77	1474.
200	5.23	33.97	26.86	1474.
225	5.16	33.98	26.88	1474.
250	5.05	34.01	26.91	1474.
275	4.98	34.01	26.92	1474.
300	4.94	34.03	26.94	1474.

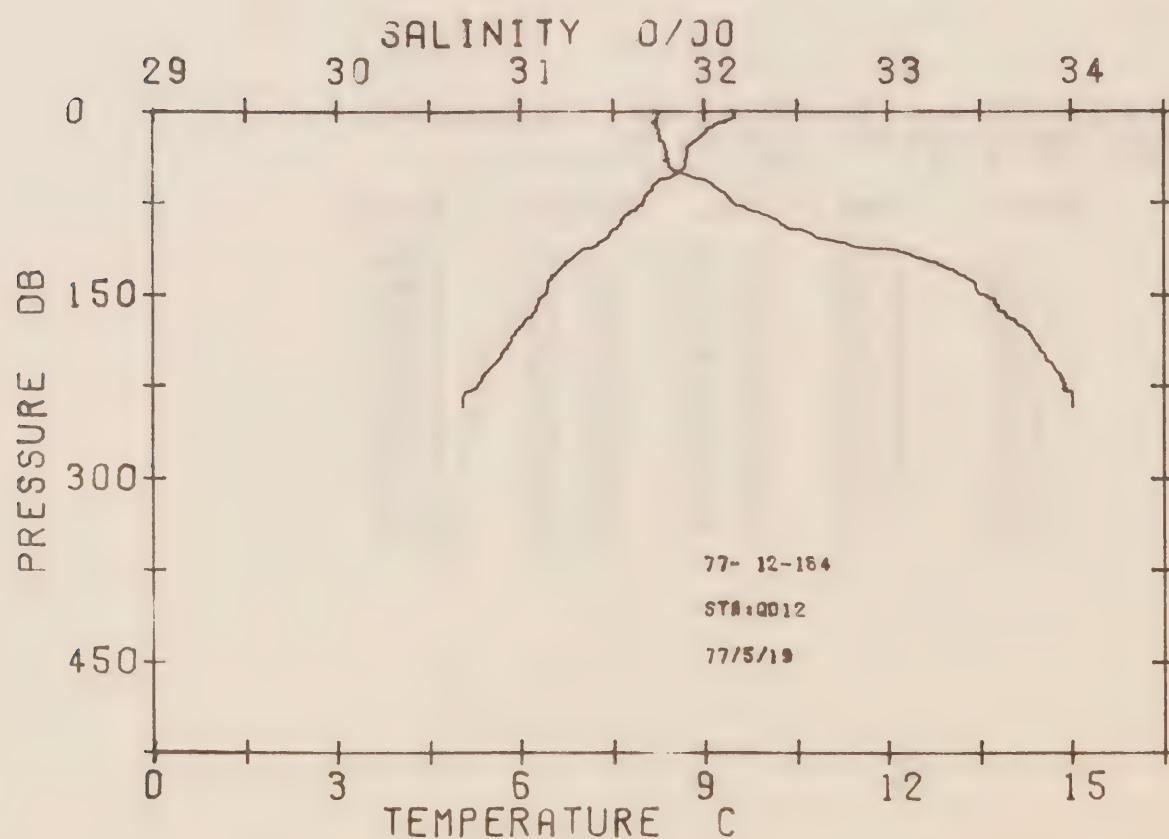
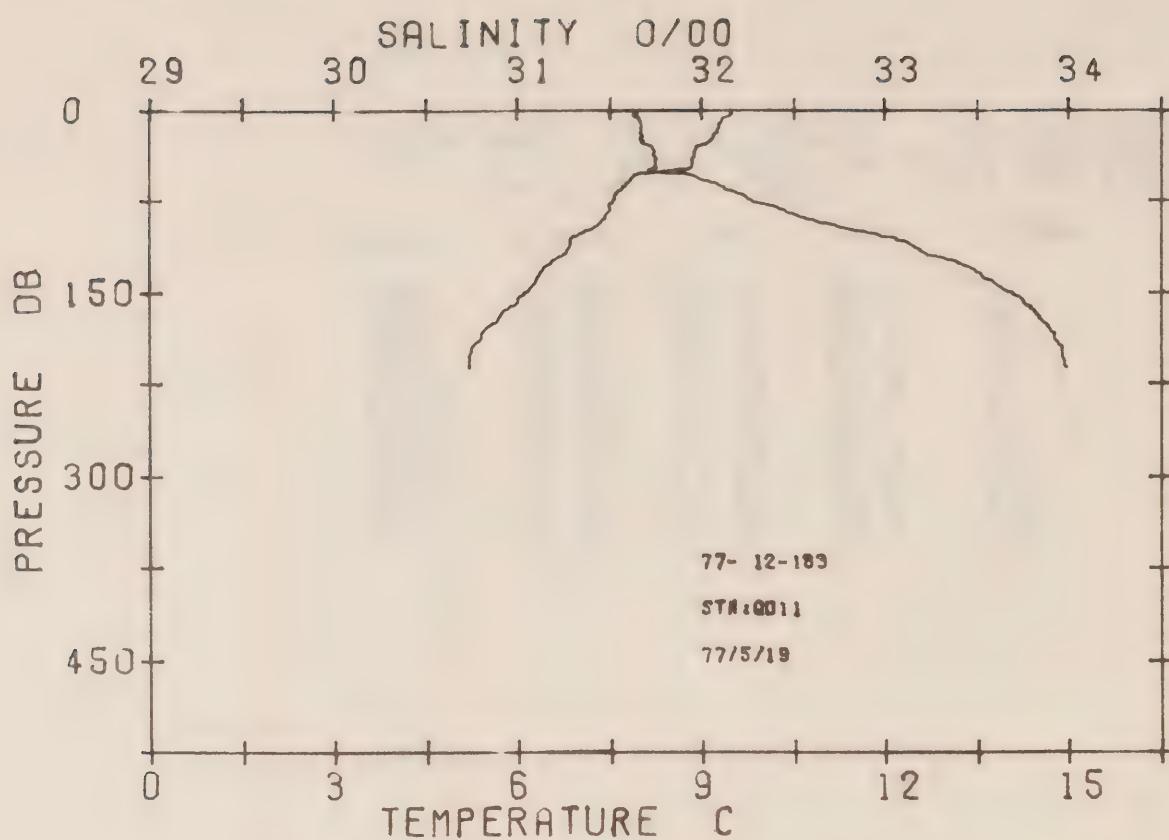


STATION QD11 CRUISE 77-12 CONS #183
 POSITION 50-20. ON 129-40. OW
 DATE 77/ 5/19 TIME 14: 7:25 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9. 48	31. 63	24. 43	1484.
10	9. 30	31. 66	24. 48	1484.
20	9. 22	31. 66	24. 49	1484.
30	8. 93	31. 73	24. 59	1483.
50	8. 62	31. 70	24. 62	1482.
75	7. 54	32. 27	25. 22	1479.
100	7. 08	32. 90	25. 78	1478.
125	6. 52	33. 39	26. 24	1477.
150	6. 14	33. 67	26. 51	1476.
175	5. 61	33. 86	26. 73	1475.
200	5. 22	33. 97	26. 86	1474.

STATION QD12 CRUISE 77-12 CONS #184
 POSITION 52-34. ON 129-53. 5W
 DATE 77/ 5/19 TIME 17: 17:21 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9. 48	31. 74	24. 52	1484.
10	9. 22	31. 71	24. 54	1483.
20	8. 97	31. 75	24. 61	1483.
30	8. 71	31. 79	24. 67	1482.
50	8. 58	31. 86	24. 75	1482.
75	8. 00	32. 16	25. 07	1480.
100	7. 45	32. 59	25. 48	1479.
125	6. 72	33. 28	26. 13	1478.
150	6. 39	33. 50	26. 35	1477.
175	6. 03	33. 72	26. 56	1476.
200	5. 68	33. 86	26. 72	1476.
225	5. 28	33. 96	26. 84	1474.

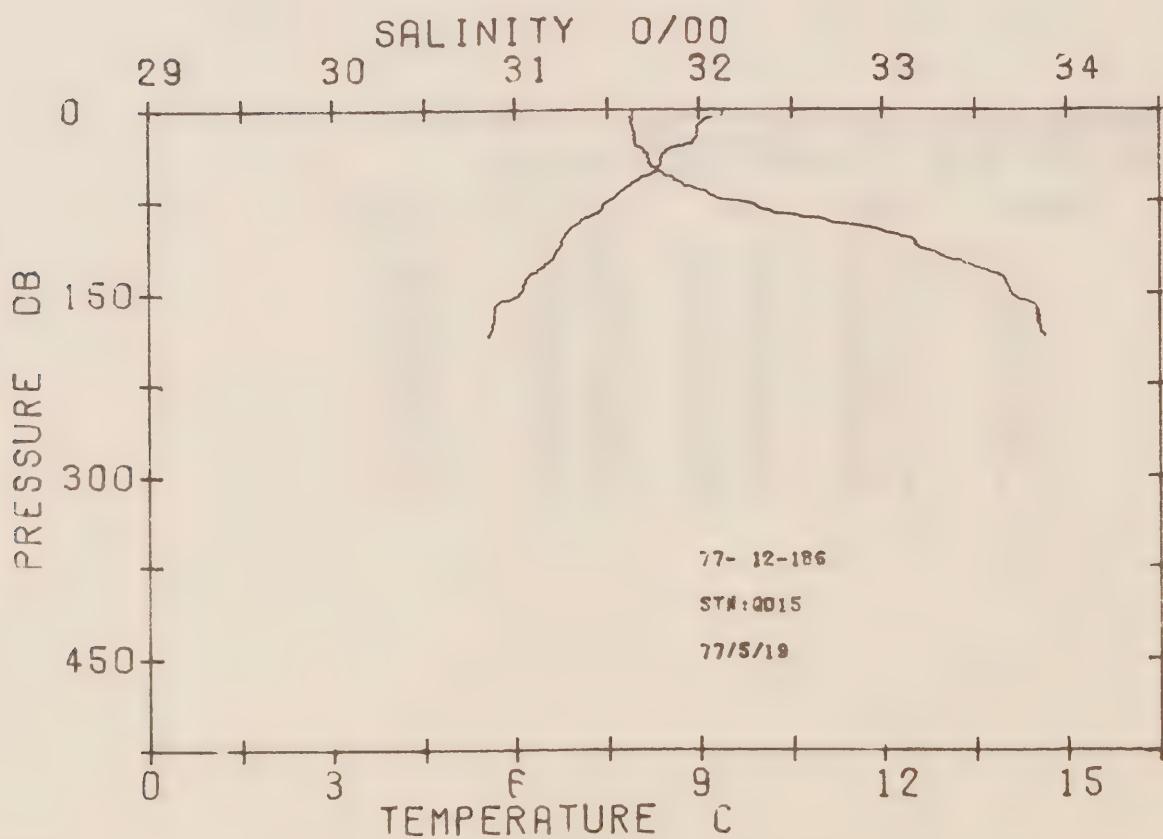
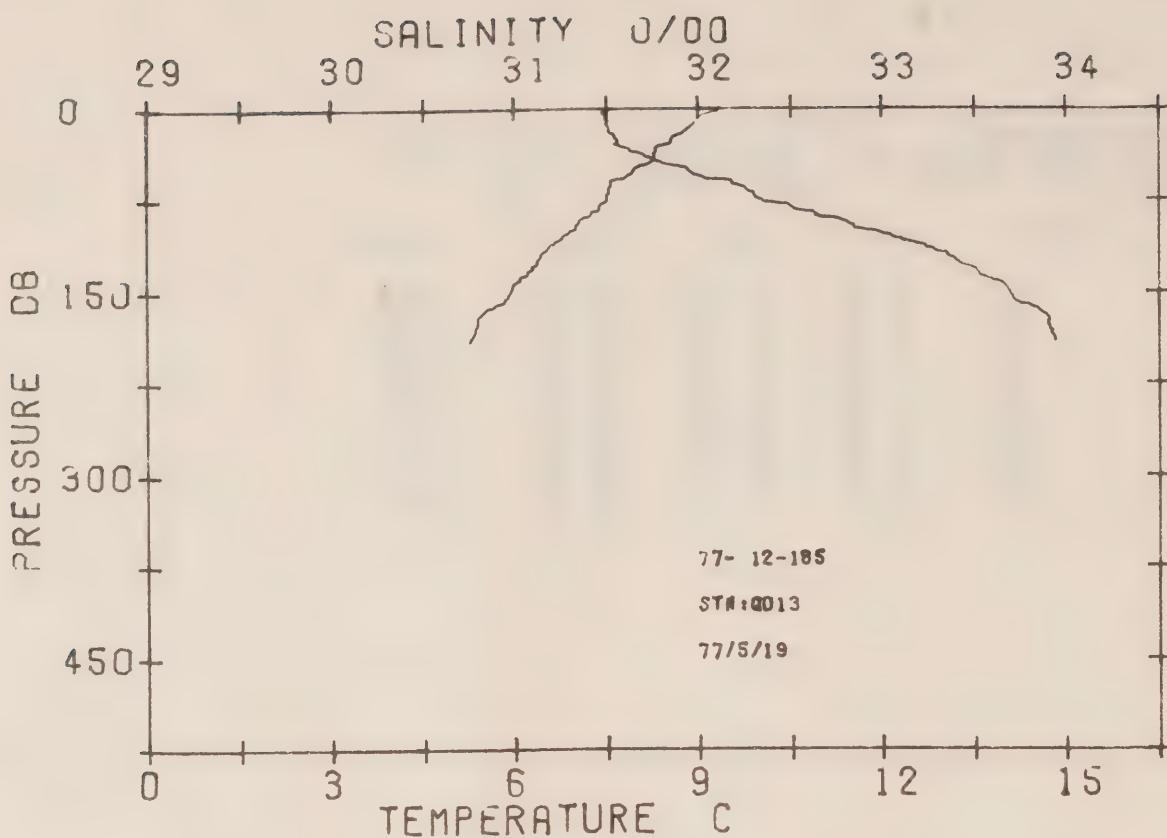


STATION QD13 CRUISE 77-12 CONS #185
 POSITION 52-50. ON 129-53. SW
 DATE 77/ 5/19 TIME 19:28:15 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.32	31.50	24.35	1483
10	8.95	31.49	24.41	1482
20	8.76	31.51	24.45	1482
30	8.52	31.56	24.53	1481
50	7.97	31.94	24.90	1480
75	7.52	32.33	25.27	1479
100	6.98	32.89	25.79	1478
125	6.38	33.40	26.27	1477
150	5.94	33.69	26.55	1476
175	5.39	33.90	26.78	1474

STATION QD15 CRUISE 77-12 CONS #186
 POSITION 52- 9. 5N 130-24. 0W
 DATE 77/ 5/19 TIME 22:33:27 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.39	31.63	24.44	1484
10	9.05	31.63	24.50	1483
20	8.96	31.65	24.53	1483
30	8.72	31.66	24.58	1482
50	8.29	31.77	24.72	1481
75	7.53	32.19	25.16	1479
100	6.85	33.00	25.89	1477
125	6.53	33.44	26.28	1477
150	6.08	33.69	26.53	1476
175	5.63	33.84	26.71	1475

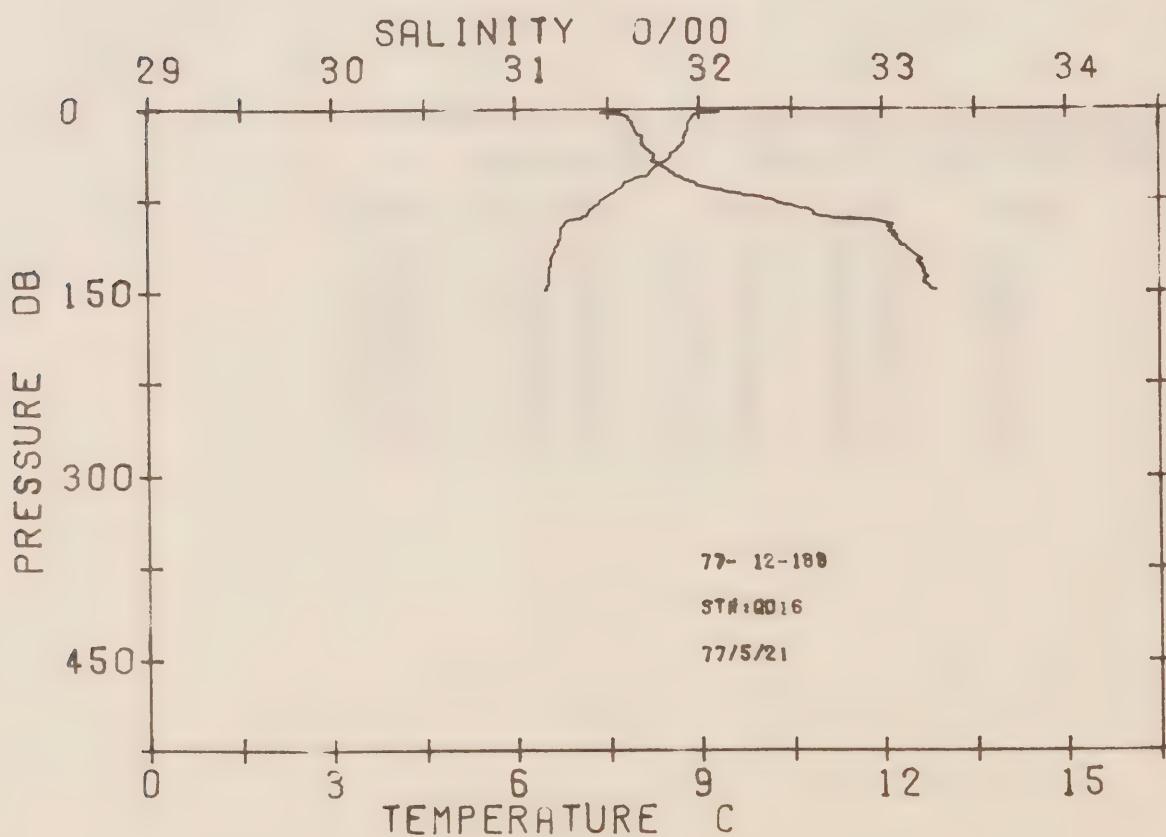
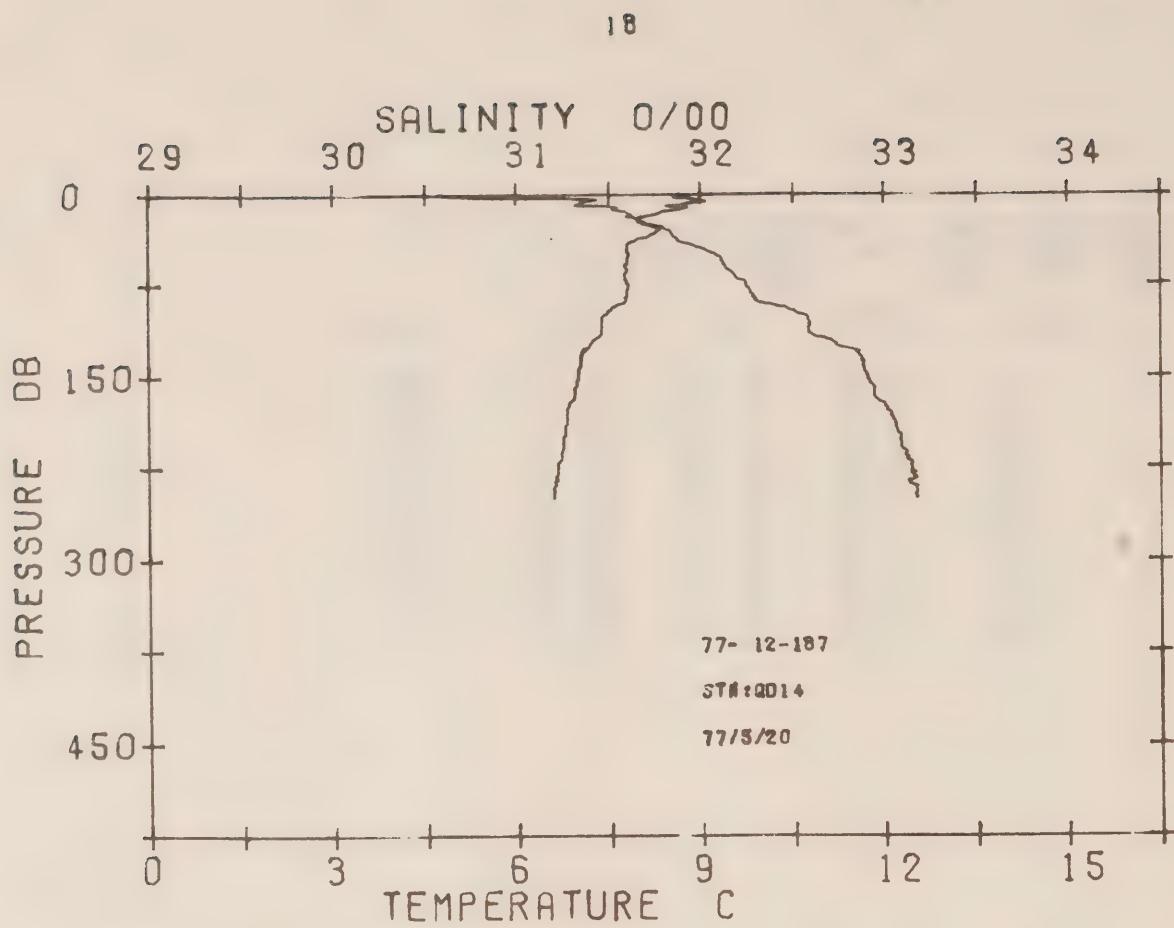


STATION QD14 CRUISE 77-12 CONS #187
 POSITION 52-54. ON 129-24. OW
 DATE 77/ 5/20 TIME 12:34:37 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	8.66	30.59	23.75	1480.
10	8.43	31.47	24.47	1480.
20	7.97	31.64	24.67	1479.
30	8.33	31.82	24.76	1481.
50	7.82	32.08	25.03	1479.
75	7.81	32.25	25.17	1480.
100	7.41	32.57	25.47	1479.
125	7.19	32.75	25.64	1479.
150	7.00	32.91	25.80	1479.
175	6.83	33.01	25.90	1479.
200	6.77	33.09	25.97	1479.
225	6.66	33.15	26.03	1479.

STATION QD16 CRUISE 77-12 CONS #188
 POSITION 53-27. 4N 130-45. OW
 DATE 77/ 5/21 TIME 14:17:38 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.22	31.55	24.41	1483.
10	8.84	31.62	24.53	1482.
20	8.78	31.66	24.57	1482.
30	8.70	31.69	24.60	1482.
50	8.22	31.83	24.78	1480.
75	7.37	32.40	25.35	1478.
100	6.72	33.05	25.94	1477.
125	6.57	33.19	26.07	1477.

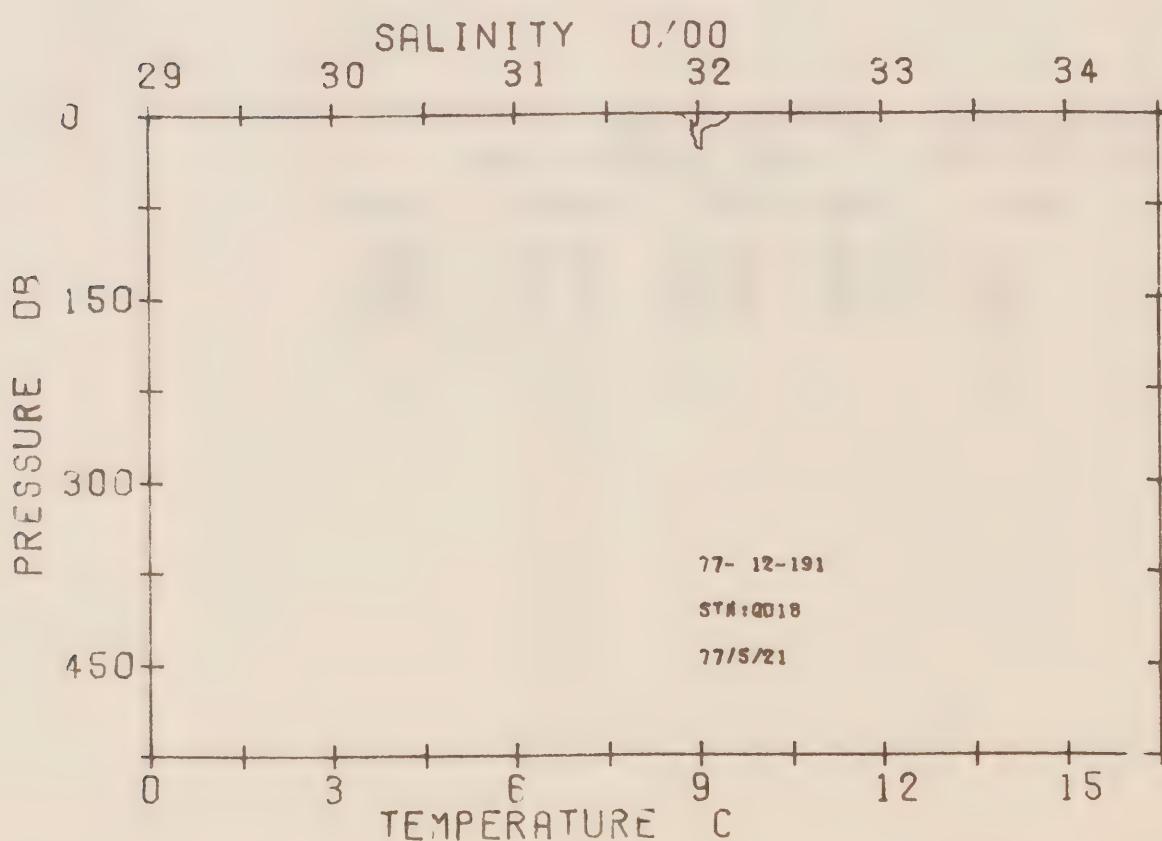
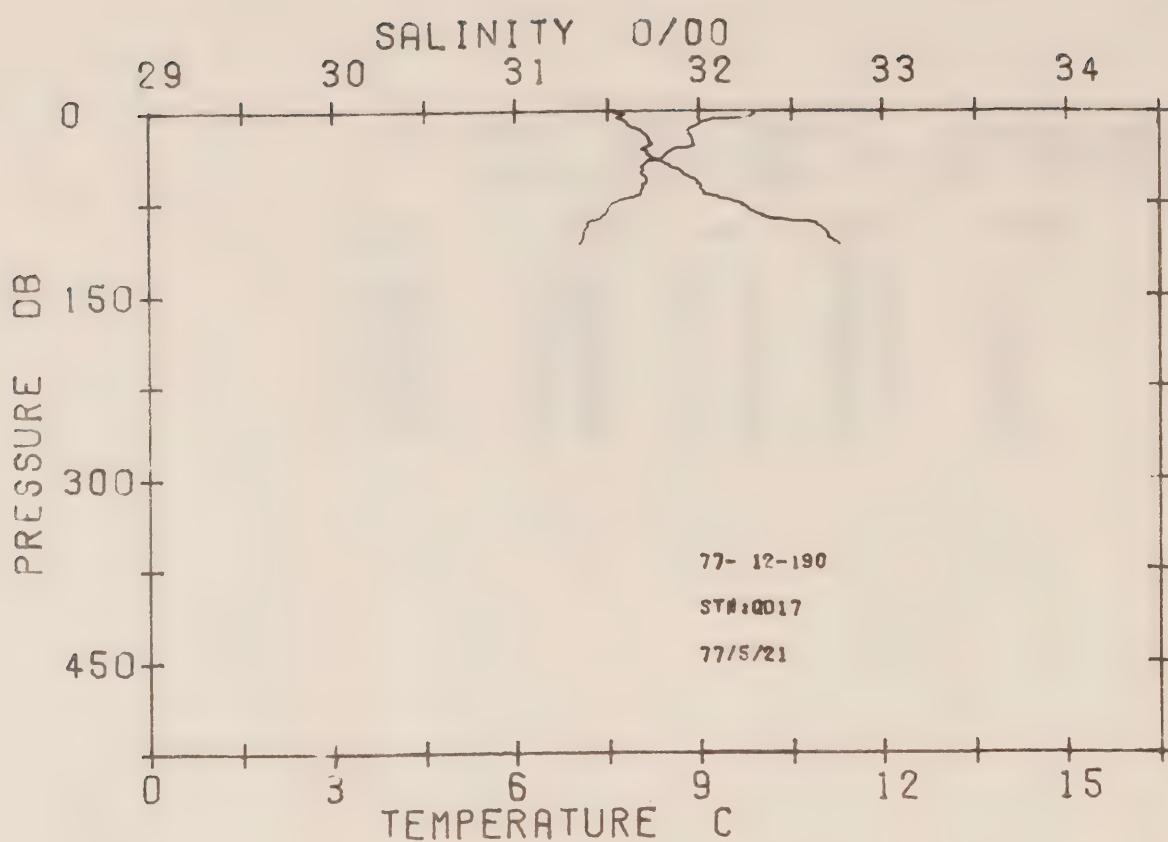


STATION QD17 CRUISE 77-12 CONS #190
POSITION 53-13.5N 130-53.0W
DATE 77/ 5/21 TIME 16:26:55 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9.91	31.55	24.30	1486.
10	9.00	31.61	24.49	1482.
20	8.84	31.70	24.59	1482.
30	8.85	31.71	24.59	1482.
50	8.07	31.91	24.86	1480.
75	7.62	32.21	25.16	1479.
100	7.11	32.70	25.62	1478.

STATION QD18 CRUISE 77-12 CONS #191
POSITION 53- .ON 131- .OW
DATE 77/ 5/21 TIME 18:45:20 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.48	31.88	24.63	1484.
10	9.22	32.00	24.76	1484.
20	9.05	31.98	24.77	1483.

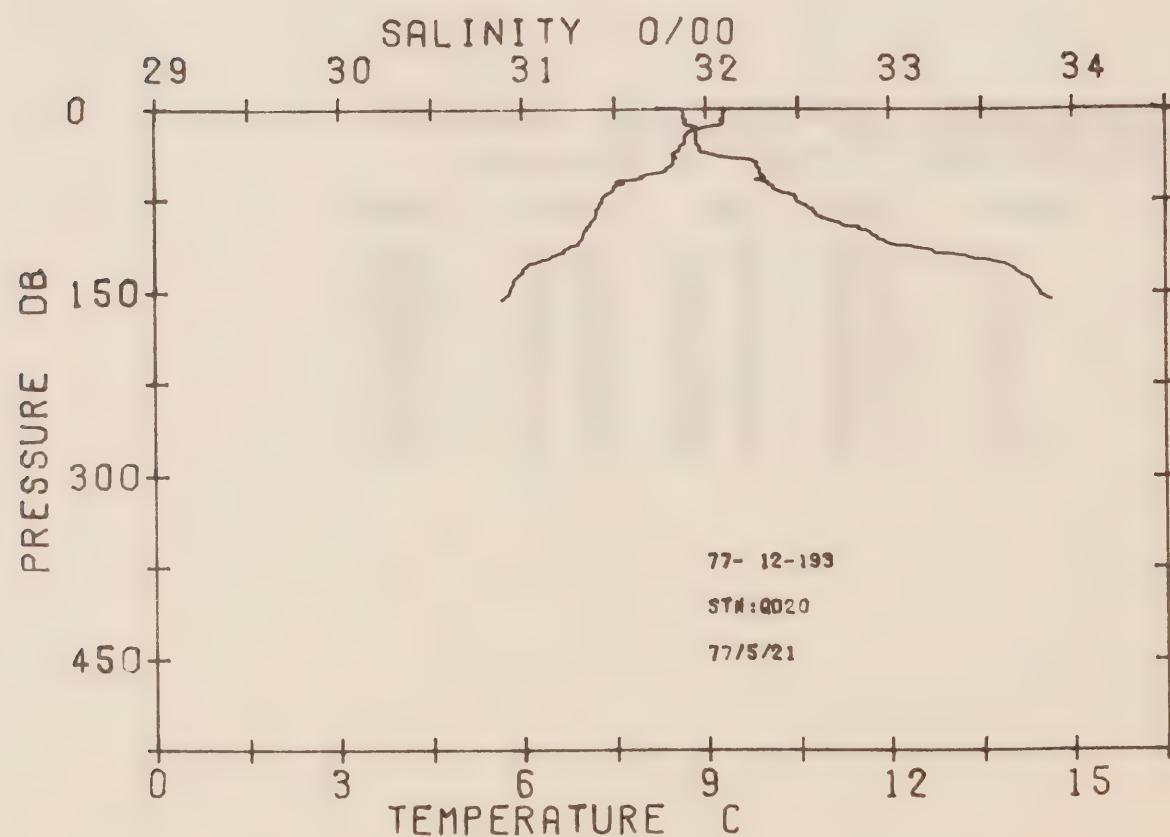
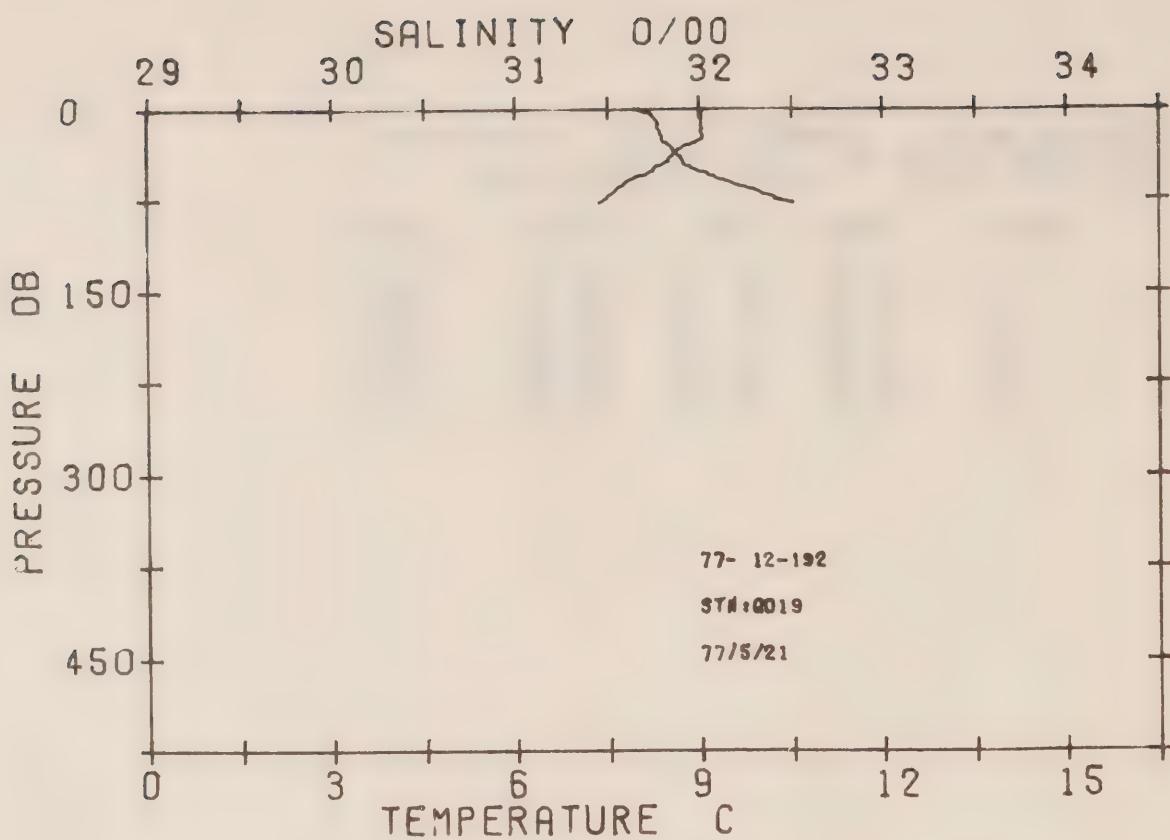


STATION QD19 CRUISE 77-12 CONS #192
 POSITION 52-48. ON 130-46. 5W
 DATE 77/ 5/21 TIME 20:34:28 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 02	31. 65	24. 52	1482.
10	9. 03	31. 77	24. 61	1483.
20	9. 02	31. 78	24. 62	1483.
30	8. 80	31. 83	24. 69	1482.
50	8. 25	31. 97	24. 88	1481.
75	7. 45	32. 42	25. 35	1479.

STATION QD20 CRUISE 77-12 CONS #193
 POSITION 52-36. 5N 130-33. 5W
 DATE 77/ 5/21 TIME 22:33:16 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 29	31. 74	24. 55	1484.
10	9. 21	31. 90	24. 68	1484.
20	8. 69	31. 94	24. 80	1482.
30	8. 65	31. 94	24. 80	1482.
50	8. 34	32. 29	25. 12	1482.
75	7. 29	32. 50	25. 43	1478.
100	7. 00	32. 88	25. 78	1478.
125	6. 24	33. 56	26. 41	1476.
150	5. 76	33. 82	26. 68	1475.

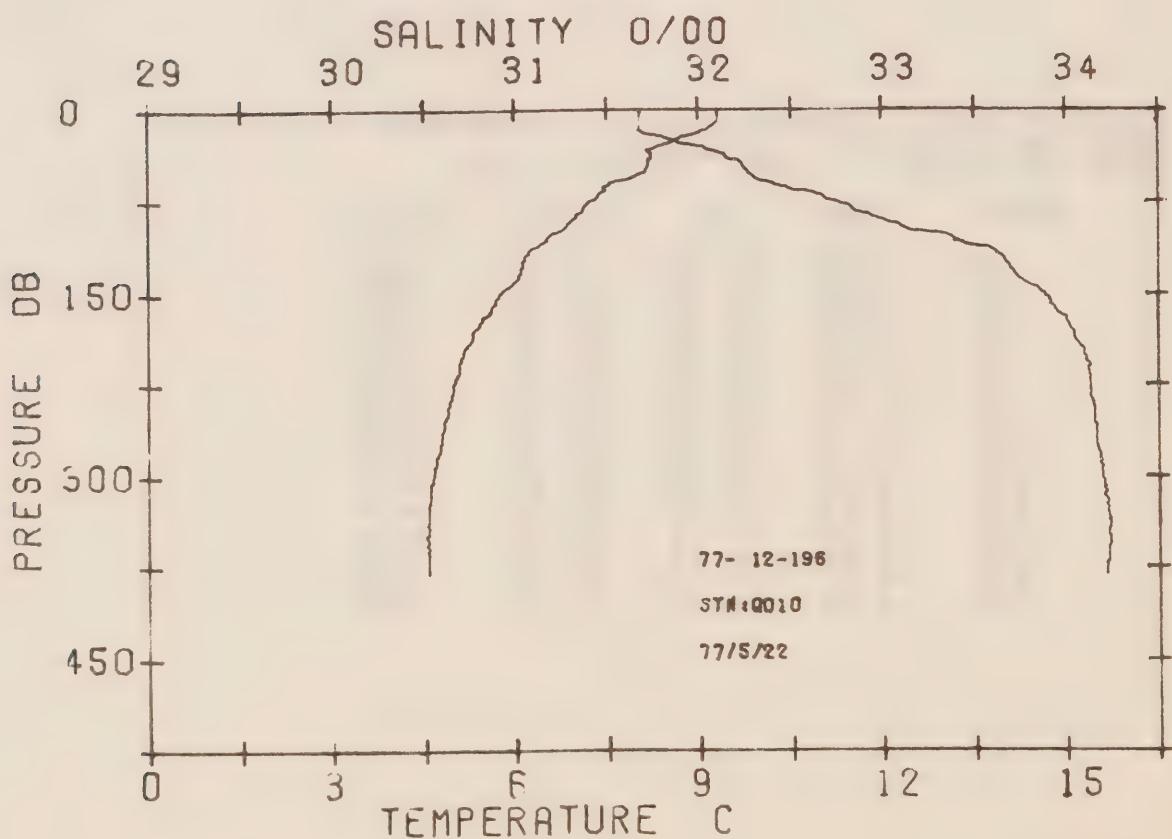
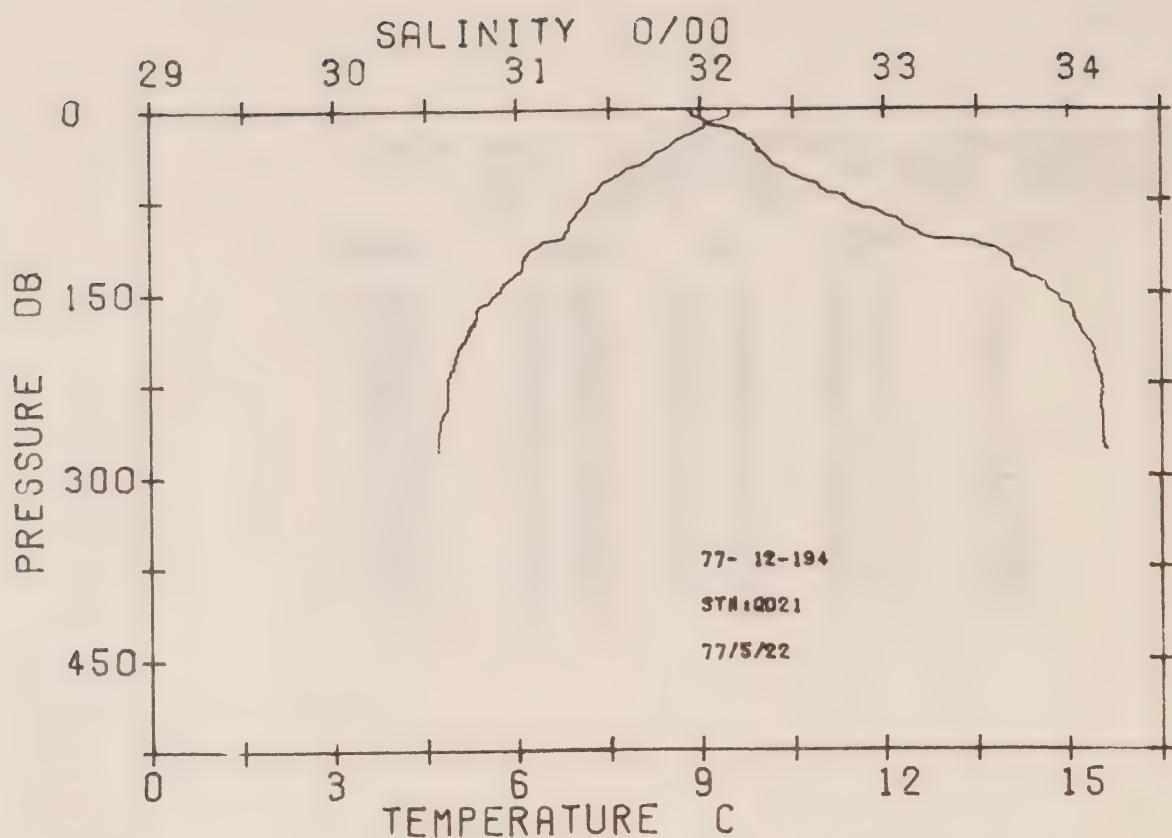


STATION QD21 CRUISE 77-12 CONS #194
 POSITION 52-24.5N 130-21.0W
 DATE 77/ 5/22 TIME 0:44:45 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.47	31.82	24.59	1484.
10	9.23	32.03	24.78	1484.
20	8.91	32.20	24.97	1483.
30	8.53	32.30	25.10	1482.
50	7.78	32.46	25.34	1480.
75	7.15	32.80	25.69	1478.
100	6.81	33.16	26.02	1478.
125	6.09	33.69	26.53	1476.
150	5.72	33.90	26.75	1475.
175	5.29	34.04	26.91	1474.
200	5.00	34.14	27.02	1473.
225	4.86	34.18	27.07	1473.
250	4.77	34.19	27.08	1473.
275	4.71	34.19	27.09	1473.

STATION QD10 CRUISE 77-12 CONS #196
 POSITION 52-16.5N 130-16.0W
 DATE 77/ 5/22 TIME 2:42: 6 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9.30	31.68	24.50	1484.
10	9.31	31.68	24.50	1484.
20	8.99	31.69	24.56	1483.
30	8.37	32.00	24.89	1481.
50	8.15	32.26	25.13	1481.
75	7.27	32.72	25.61	1478.
100	6.73	33.20	26.06	1477.
125	6.13	33.68	26.52	1476.
150	5.77	33.88	26.72	1475.
175	5.43	34.02	26.87	1474.
200	5.14	34.10	26.97	1474.
225	4.99	34.14	27.02	1474.
250	4.88	34.15	27.04	1473.
275	4.77	34.17	27.07	1473.
300	4.66	34.20	27.10	1473.

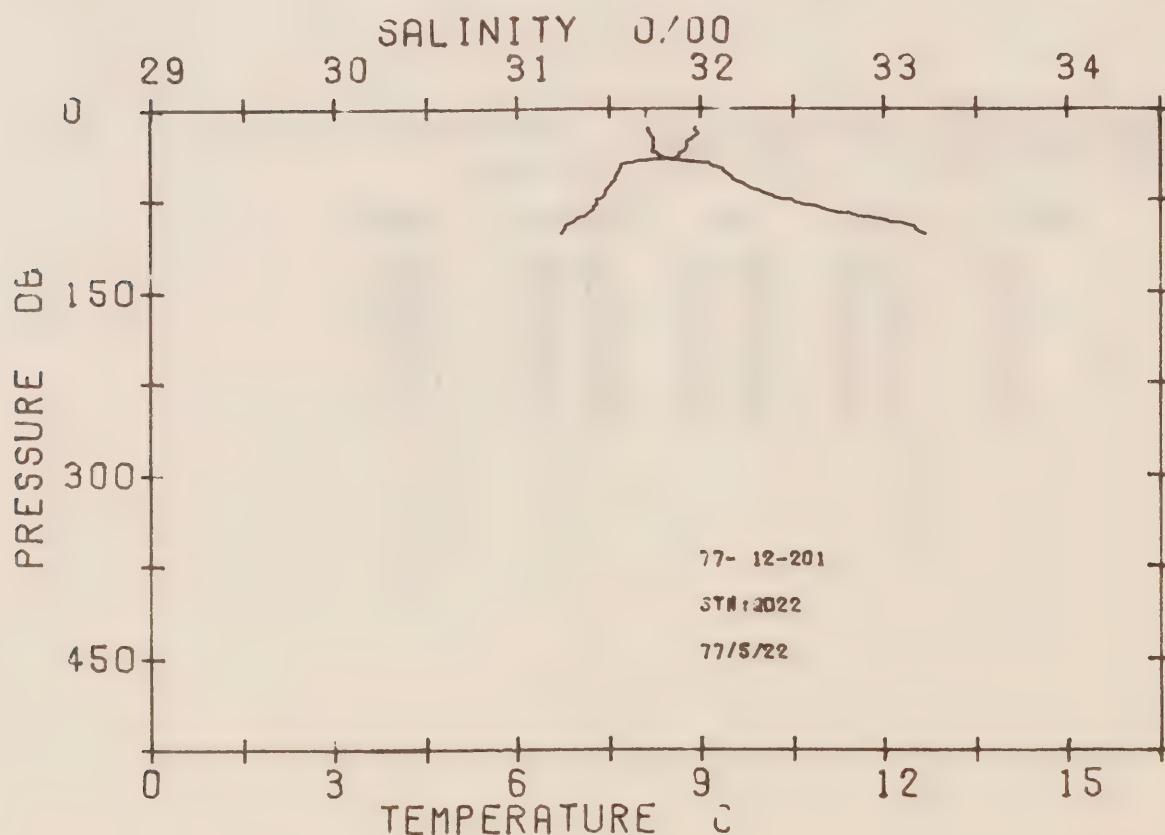
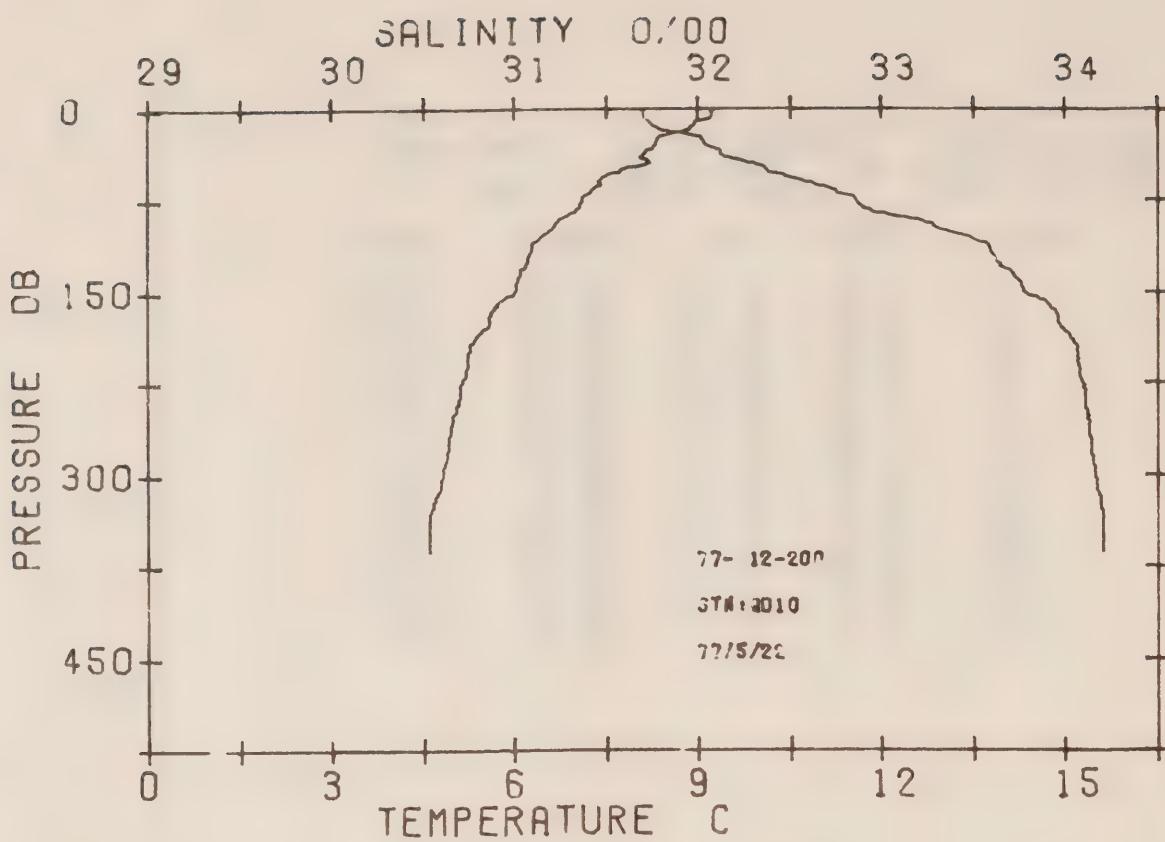


STATION QD10 CRUISE 77-12 CONS #200
 POSITION 52-16.5N 130-16.0W
 DATE 77/ 5/22 TIME 6:28: 3 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.23	31.69	24.52	1483.
10	8.95	31.74	24.60	1482.
20	8.61	31.92	24.79	1482.
30	8.29	32.04	24.94	1481.
50	7.74	32.37	25.28	1479.
75	7.09	32.87	25.75	1478.
100	6.56	33.37	26.22	1477.
125	6.22	33.63	26.47	1476.
150	6.01	33.78	26.61	1476.
175	5.58	33.97	26.82	1475.
200	5.24	34.08	26.94	1474.
225	5.12	34.10	26.97	1474.
250	5.02	34.12	27.00	1474.
275	4.91	34.15	27.03	1474.
300	4.81	34.17	27.06	1474.

STATION QD22 CRUISE 77-12 CONS #201
 POSITION 52- 2.5N 129-44.0W
 DATE 77/ 5/22 TIME 10: 1:35 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.01	31.70	24.56	1482.
10	8.95	31.71	24.57	1482.
20	8.94	31.73	24.59	1483.
30	8.78	31.74	24.63	1482.
50	7.68	32.12	25.09	1479.
75	7.29	32.50	25.44	1478.
100	6.76	33.19	26.05	1477.

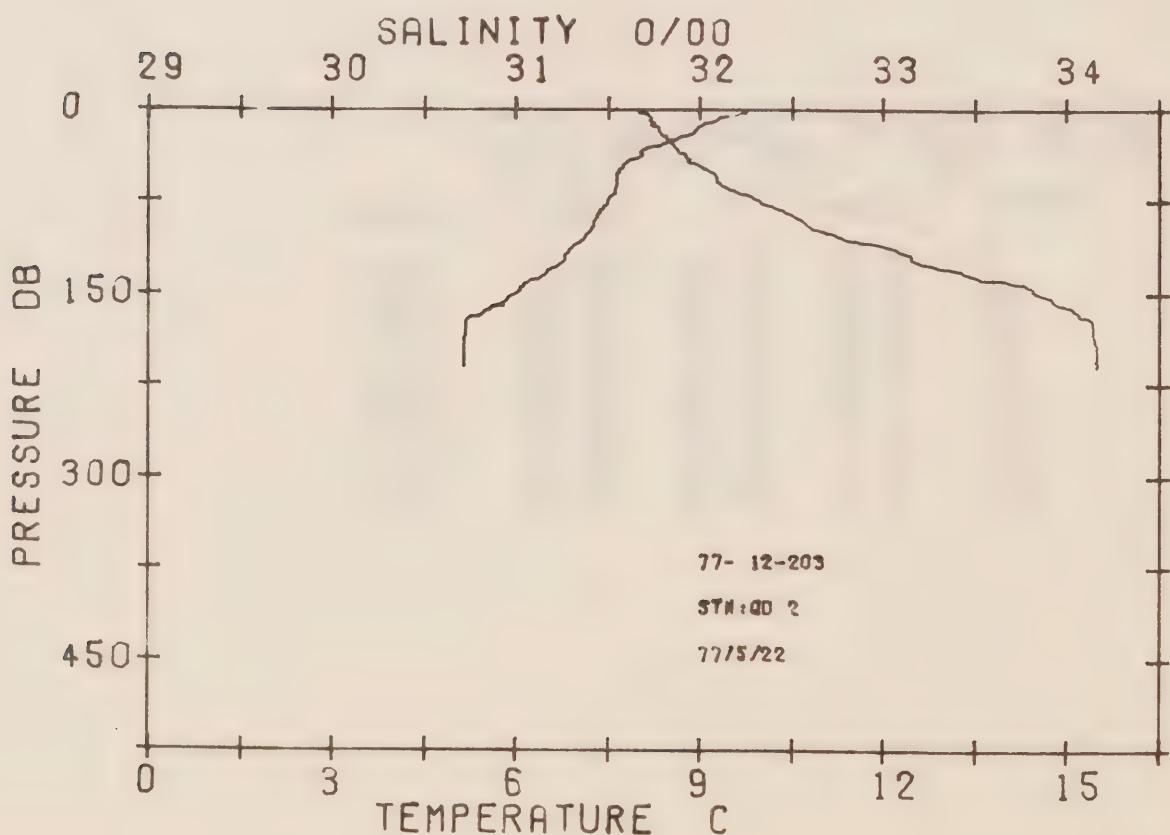
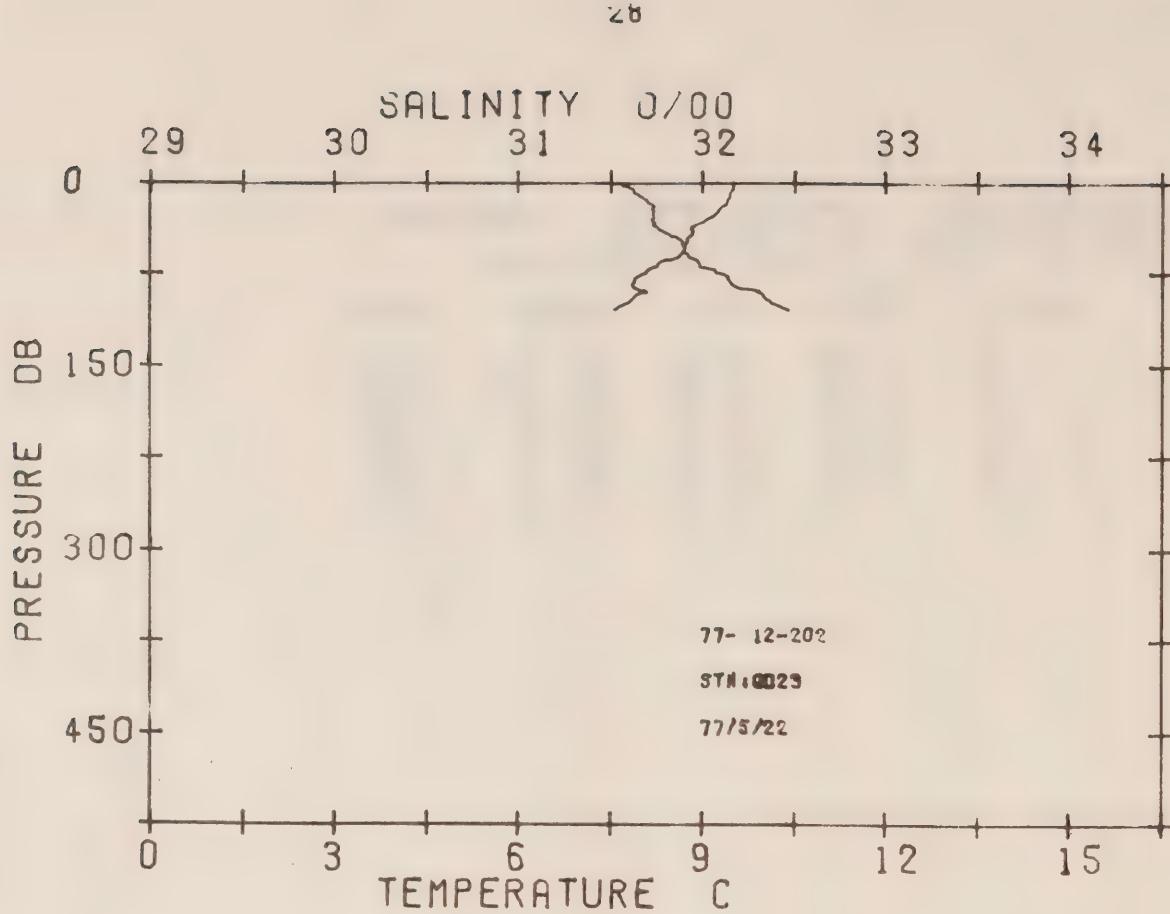


STATION QD23 CRUISE 77-12 CONS #202
 POSITION 51-46. 5N 129-14. 0W
 DATE 77/ 5/22 TIME 13:10:14 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 50	31. 55	24. 37	1484.
10	9. 43	31. 65	24. 46	1484.
20	9. 31	31. 74	24. 55	1484.
30	9. 06	31. 73	24. 58	1483.
50	8. 73	31. 89	24. 75	1482.
75	8. 06	32. 09	25. 00	1481.
100	7. 74	32. 40	25. 30	1480.

STATION QD 2 CRUISE 77-12 CONS #203
 POSITION 51-25. ON 128-35. 0W
 DATE 77/ 5/22 TIME 15:39:23 PST

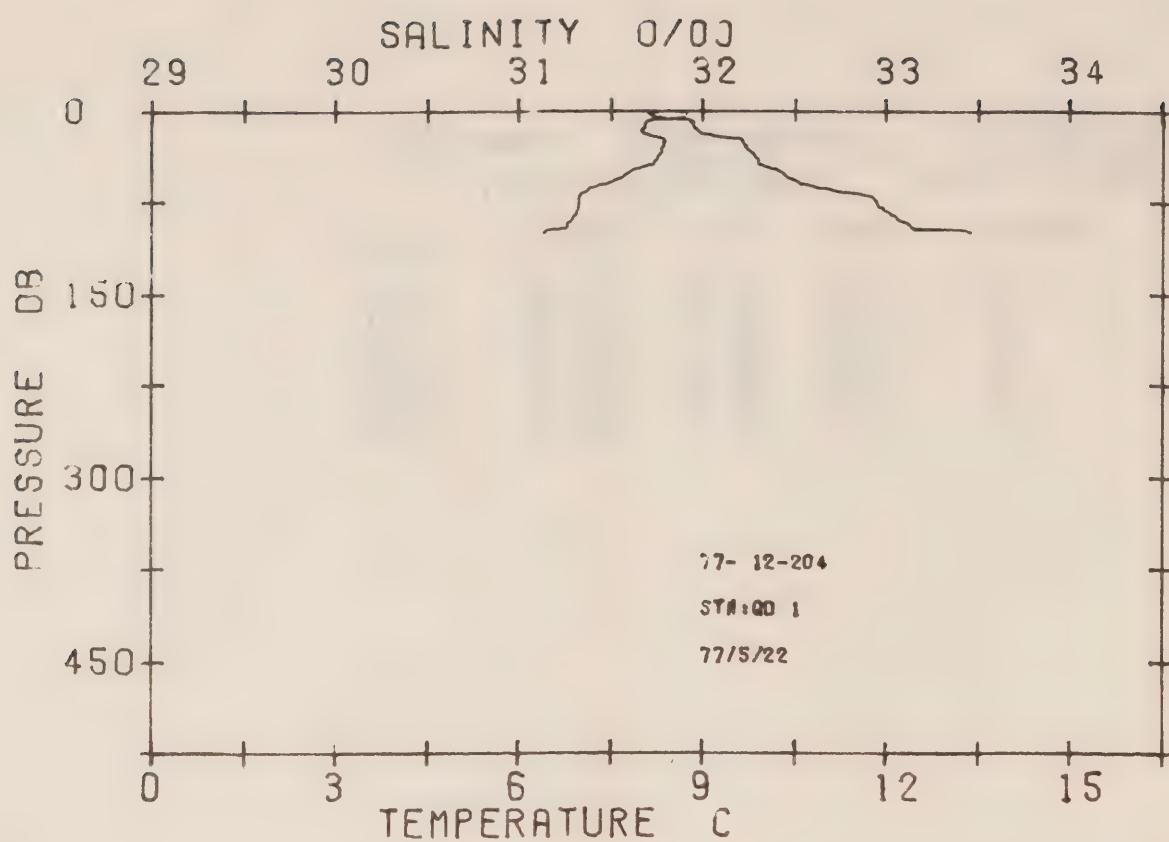
DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9. 75	31. 66	24. 41	1485.
10	9. 24	31. 73	24. 55	1484.
20	8. 89	31. 78	24. 64	1482.
30	8. 32	31. 85	24. 78	1481.
50	7. 68	32. 04	25. 02	1479.
75	7. 49	32. 32	25. 27	1479.
100	7. 18	32. 68	25. 59	1478.
125	6. 74	33. 20	26. 06	1478.
150	6. 01	33. 83	26. 66	1476.
175	5. 16	34. 14	27. 00	1473.
200	5. 14	34. 16	27. 02	1474.



STATION QD 1 CRUISE 77-12 CONS #204
POSITION 51- . ON 127-55. OW
DATE 77/ 5/22 TIME 19: 5:32 PST

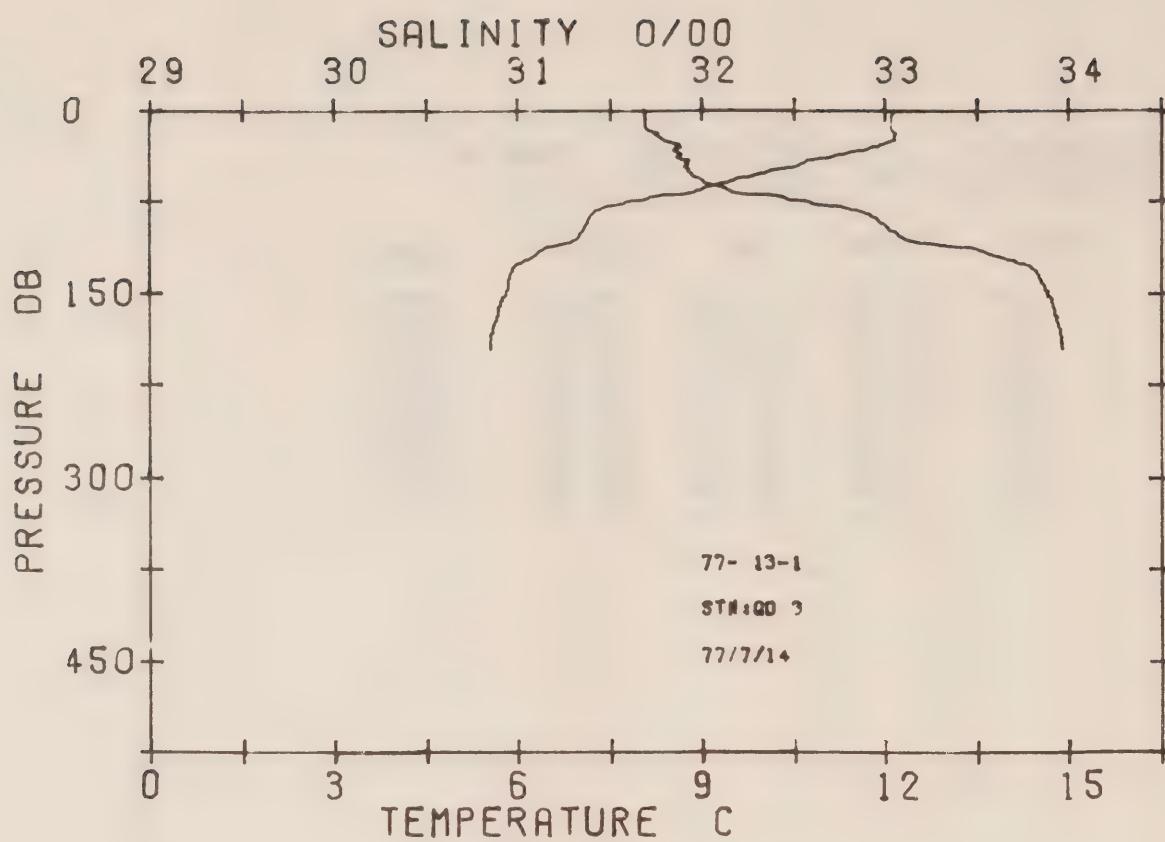
DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	8.61	31.75	24.66	1481.
10	8.06	31.94	24.89	1479.
20	8.09	32.04	24.96	1480.
30	8.32	32.24	25.09	1481.
50	7.82	32.42	25.30	1480.
75	6.98	32.95	25.83	1477.
100	6.41	33.46	26.31	1476.

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STATION QD 3 CRUISE 77-13 CONS # 1
POSITION 51-15. ON 129- 3.0W
DATE 77/ 7/14 TIME 14:12:55 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12.11	31.69	24.02	1494
10	12.09	31.69	24.03	1494
20	12.17	31.74	24.06	1494
30	11.87	31.87	24.21	1494
50	10.11	31.93	24.56	1488
75	7.84	32.55	25.40	1480
100	7.02	33.06	25.91	1478
125	6.06	33.72	26.56	1476
150	5.80	33.88	26.72	1475
175	5.61	33.94	26.79	1475

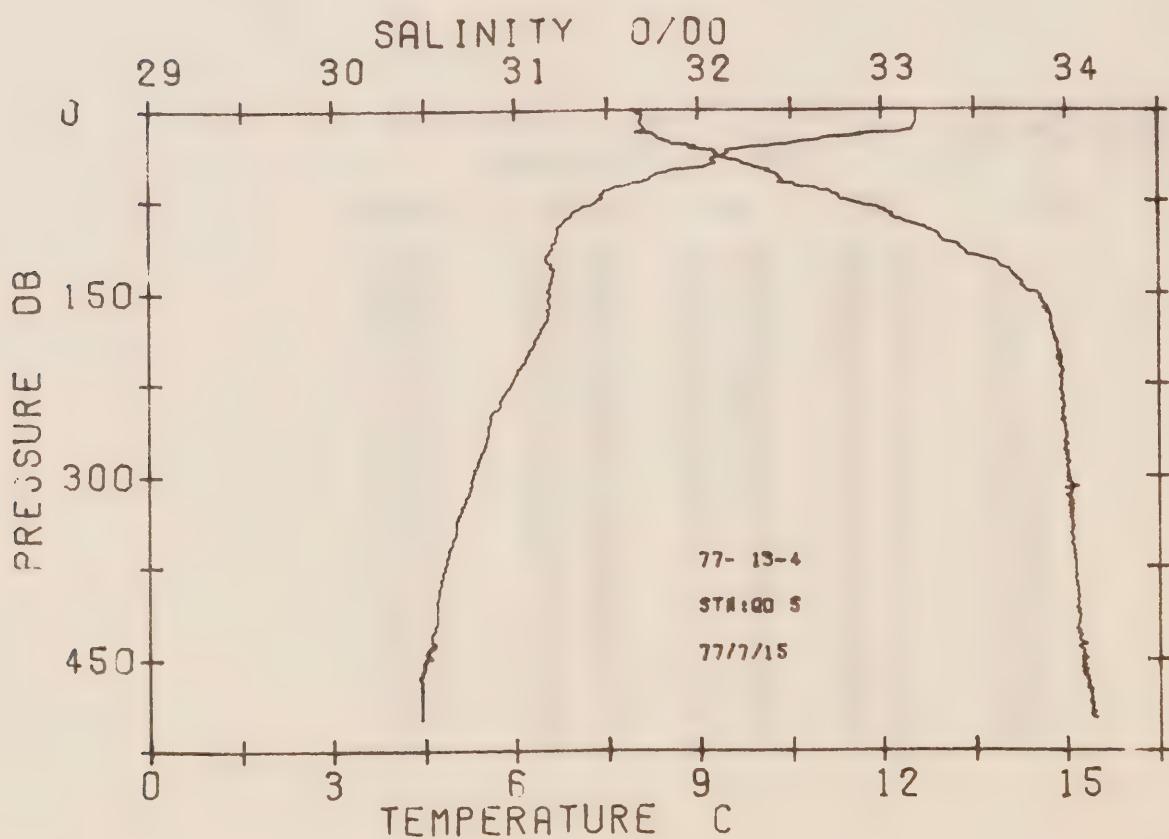
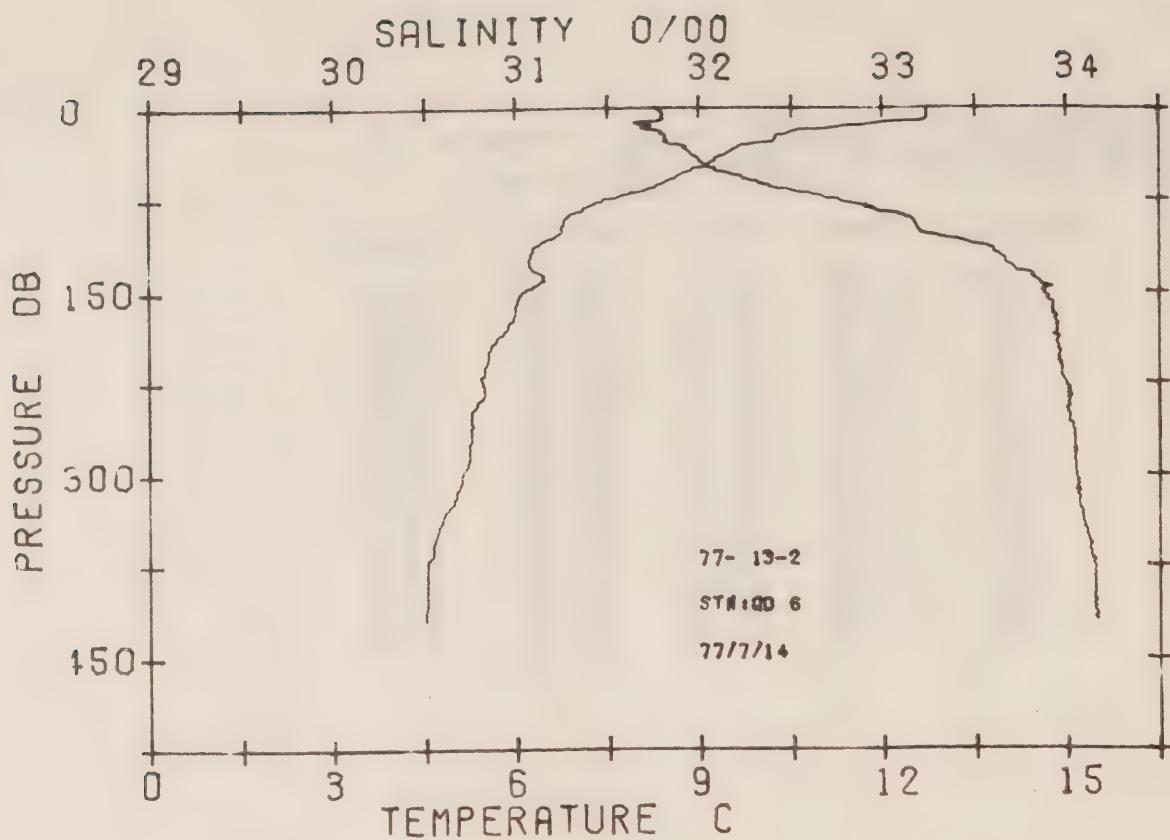


STATION QD 6 CRUISE 77-13 CONS # 2
 POSITION 51-20. ON 130- 3.0W
 DATE 77/ 7/14 TIME 21:38:45 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12.72	31.77	23.97	1496.
10	12.71	31.81	24.00	1496.
20	10.50	31.79	24.39	1488.
30	9.79	31.85	24.56	1486.
50	8.91	32.09	24.88	1483.
75	7.44	32.75	25.61	1479.
100	6.75	33.20	26.06	1477.
125	6.21	33.67	26.50	1476.
150	6.12	33.86	26.66	1477.
175	5.91	33.94	26.75	1476.
200	5.55	33.96	26.81	1475.
225	5.46	33.99	26.85	1475.
250	5.26	34.01	26.89	1475.
275	5.25	34.05	26.92	1475.
300	5.12	34.06	26.94	1475.
400	4.54	34.15	27.08	1474.

STATION QD 5 CRUISE 77-13 CONS # 4
 POSITION 51- . ON 130- 5.0W
 DATE 77/ 7/15 TIME 0:44:15 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.55	31.64	23.90	1495.
10	12.56	31.68	23.94	1495.
20	11.80	31.75	24.13	1493.
30	10.13	31.94	24.57	1487.
50	8.59	32.39	25.16	1483.
75	7.35	32.81	25.67	1479.
100	6.68	33.28	26.13	1477.
125	6.51	33.63	26.43	1477.
150	6.51	33.80	26.57	1478.
175	6.48	33.93	26.67	1478.
200	6.21	33.97	26.73	1478.
225	5.94	33.98	26.78	1477.
250	5.59	33.98	26.83	1476.
275	5.50	34.01	26.85	1476.
300	5.30	34.01	26.88	1476.
400	4.72	34.07	27.00	1475.
500	4.42	34.15	27.09	1476.
600	4.25	34.24	27.18	1477.
700	3.91	34.30	27.26	1477.
800	3.80	34.36	27.32	1478.
900	3.59	34.41	27.38	1479.



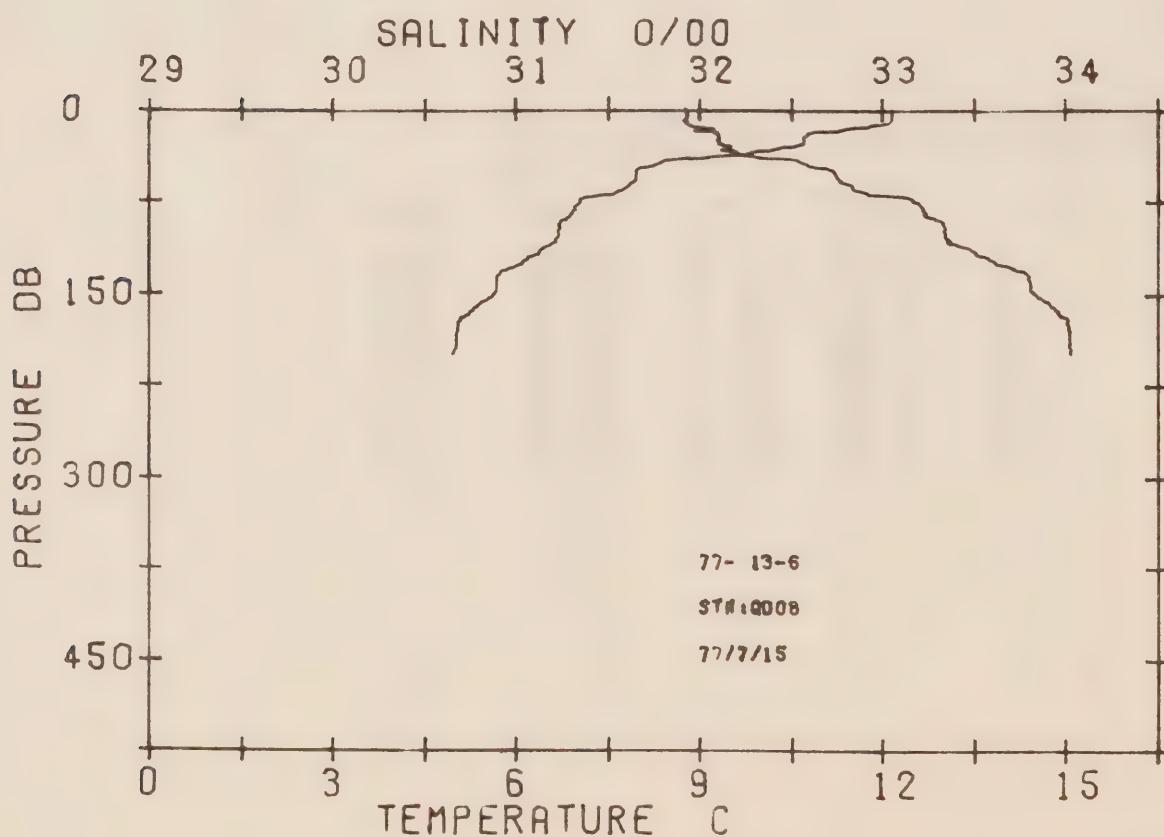
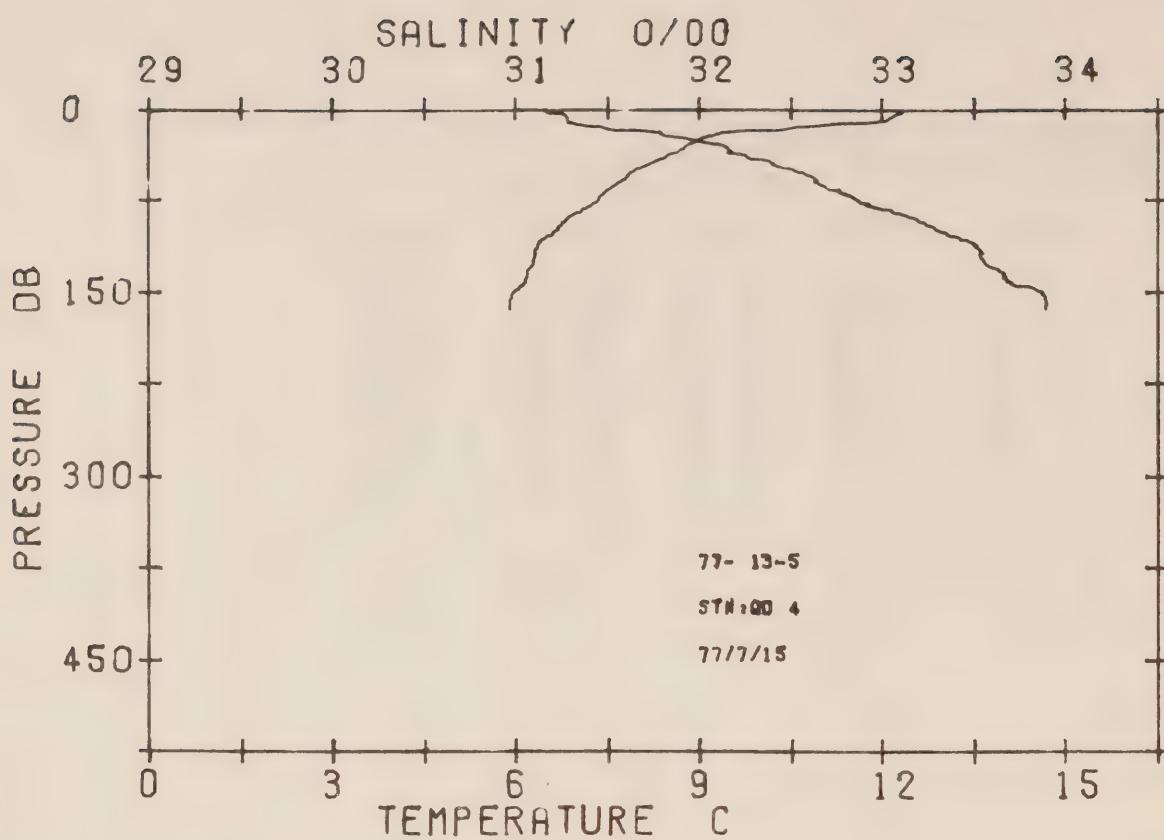
STATION QD 4 CRUISE 77-13 CONS # 5
 POSITION 51- . ON 129-17. OW
 DATE 77/ 7/15 TIME 4:29:49 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.32	31.16	23.58	1494.
10	11.93	31.28	23.74	1493.
20	9.35	31.80	24.58	1484.
30	8.78	32.13	24.93	1483.
50	7.95	32.52	25.36	1480.
75	7.34	32.86	25.72	1479.
100	6.65	33.31	26.16	1477.
125	6.27	33.56	26.40	1476.
150	5.97	33.86	26.68	1476.

STATION QD08 CRUISE 77-13 CONS # 6
 POSITION 51-44.5N 130-47.0W
 DATE 77/ 7/15 TIME 18:56:34 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.15	31.93	24.20	1494.
10	12.11	31.94	24.22	1494.
20	10.77	32.08	24.57	1490.
30	10.50	32.17	24.69	1489.
50	7.94	32.73	25.53	1481.
75	7.04	33.16	25.99	1478.
100	6.70	33.34	26.18	1477.
125	6.09	33.62	26.47	1476.
150	5.65	33.83	26.70	1475.
175	5.05	34.02	26.91	1473.

38

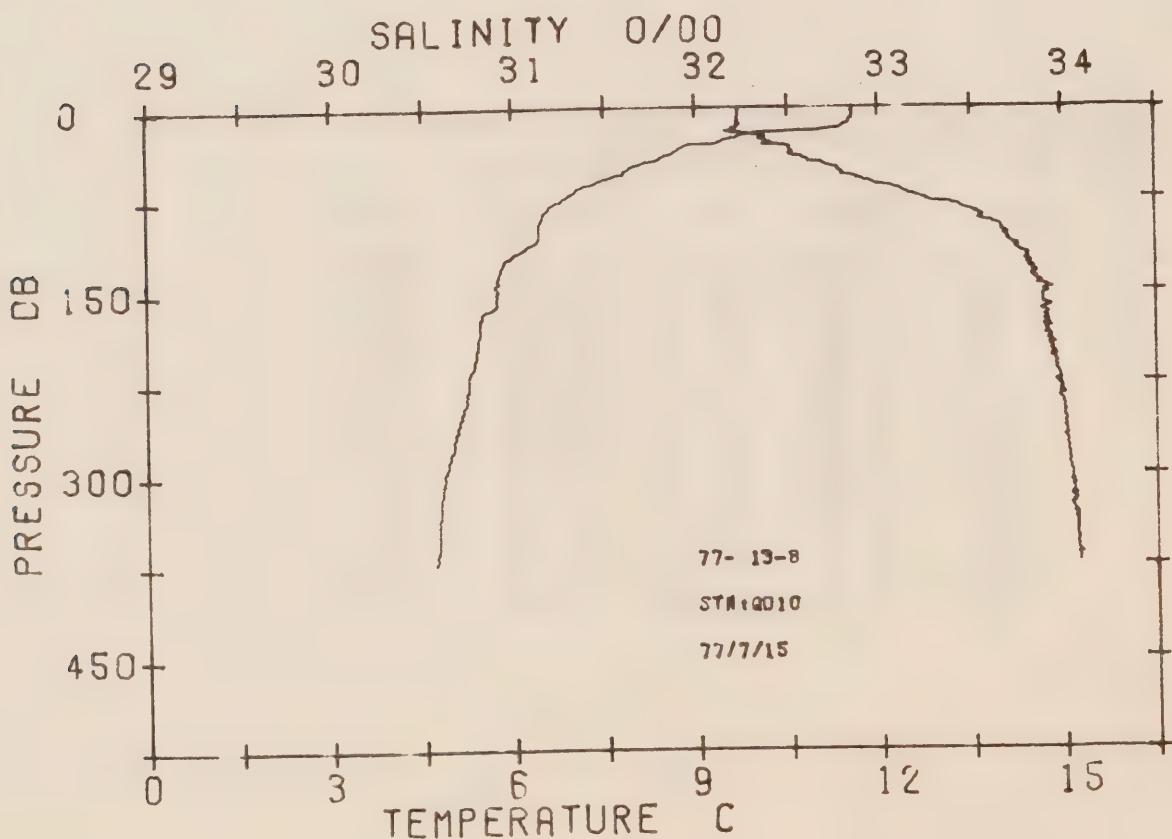
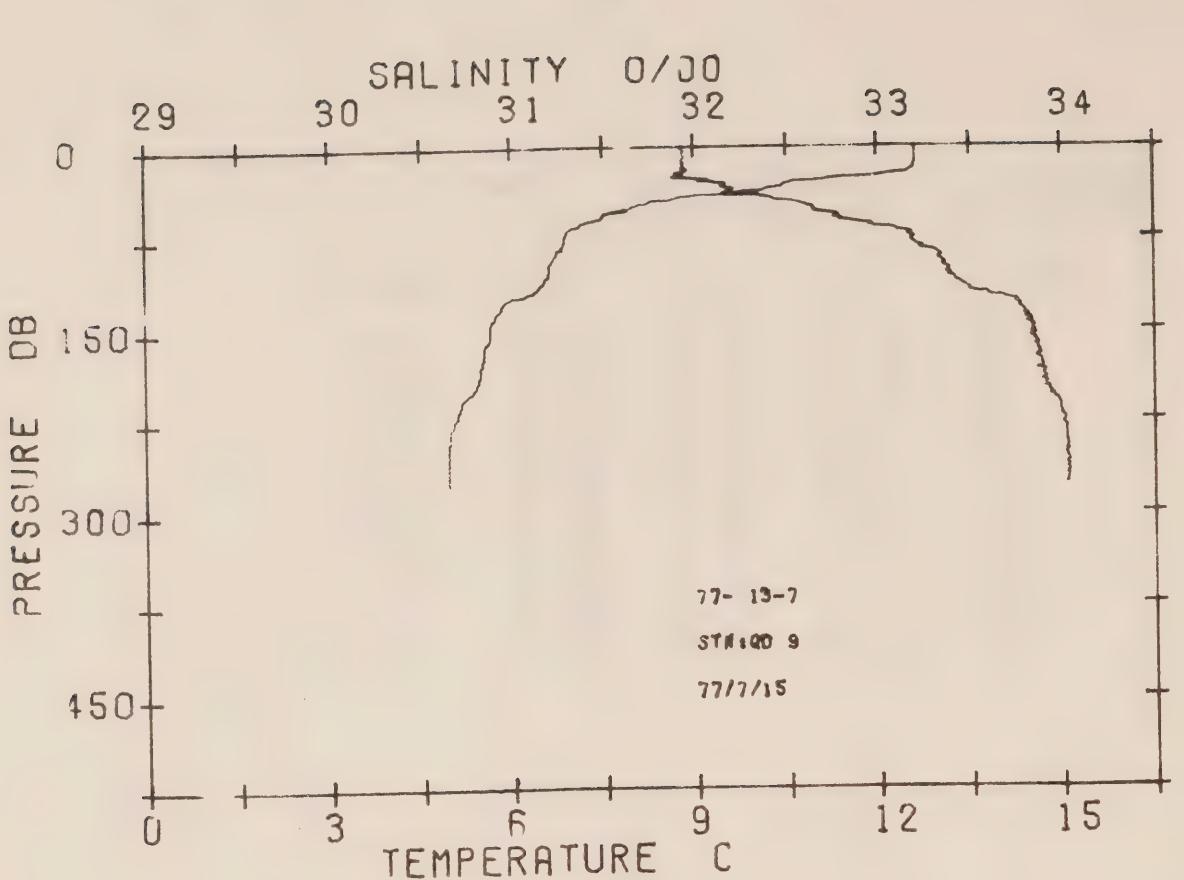


STATION QD 9 CRUISE 77-13 CONS # 7
 POSITION 52- 4. ON 130-31. OW
 DATE 77/ 7/15 TIME 20:41:16 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.63	31.94	24.12	1496.
10	12.63	31.95	24.13	1496.
20	12.55	31.97	24.16	1496.
30	10.55	32.13	24.65	1489.
50	7.97	32.64	25.45	1481.
75	6.87	33.21	26.05	1477.
100	6.62	33.40	26.23	1477.
125	5.97	33.70	26.56	1475.
150	5.65	33.85	26.71	1475.
175	5.53	33.89	26.76	1475.
200	5.37	33.94	26.81	1474.
225	5.05	34.02	26.92	1474.
250	4.96	34.04	26.94	1474.
275	4.95	34.03	26.93	1474.

STATION QD10 CRUISE 77-13 CONS # 8
 POSITION 52-16. 5N 130-16. 0W
 DATE 77/ 7/15 TIME 22:20:22 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11.57	32.24	24.55	1493.
10	11.52	32.23	24.55	1492.
20	10.71	32.16	24.64	1490.
30	9.30	32.37	25.04	1485.
50	7.91	32.78	25.57	1481.
75	6.82	33.27	26.10	1477.
100	6.43	33.69	26.48	1477.
125	5.85	33.79	26.64	1475.
150	5.77	33.89	26.73	1475.
175	5.46	33.90	26.78	1474.
200	5.39	33.93	26.81	1474.
225	5.26	33.95	26.84	1474.
250	5.15	34.01	26.90	1474.
275	5.01	34.03	26.93	1474.
300	4.86	34.05	26.96	1474.

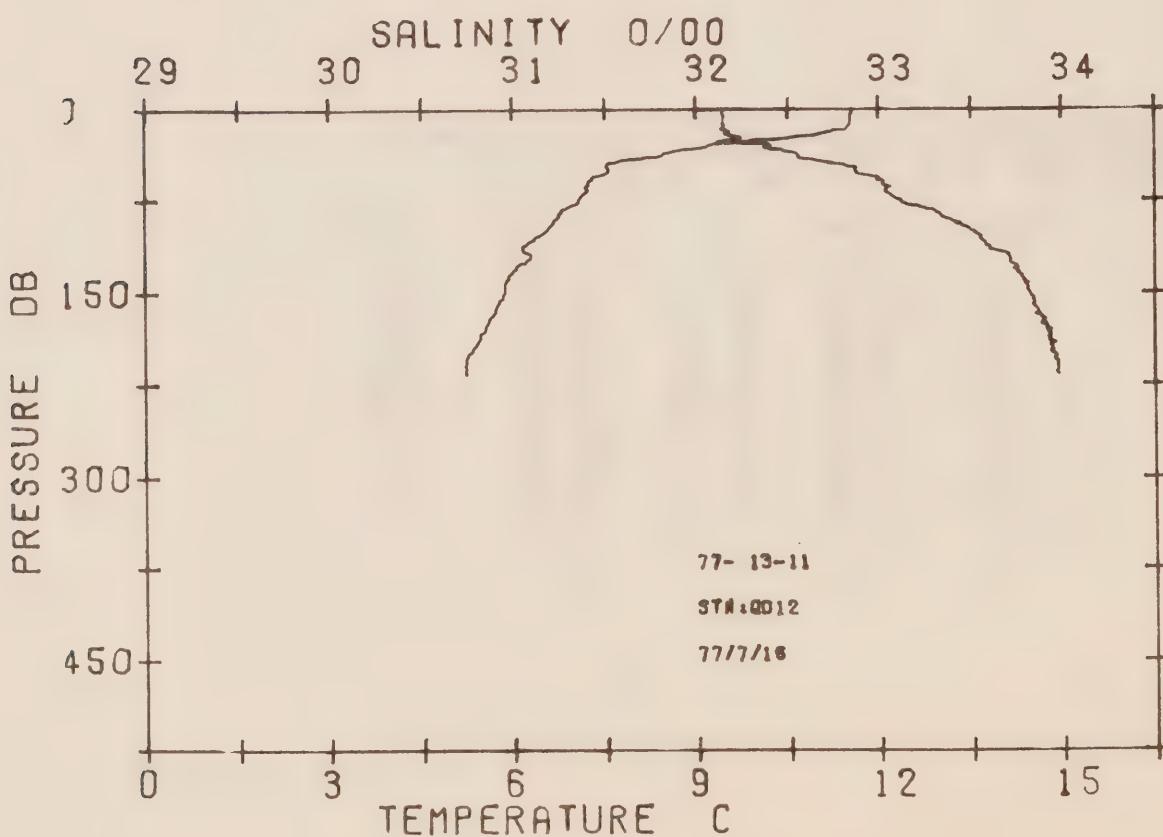
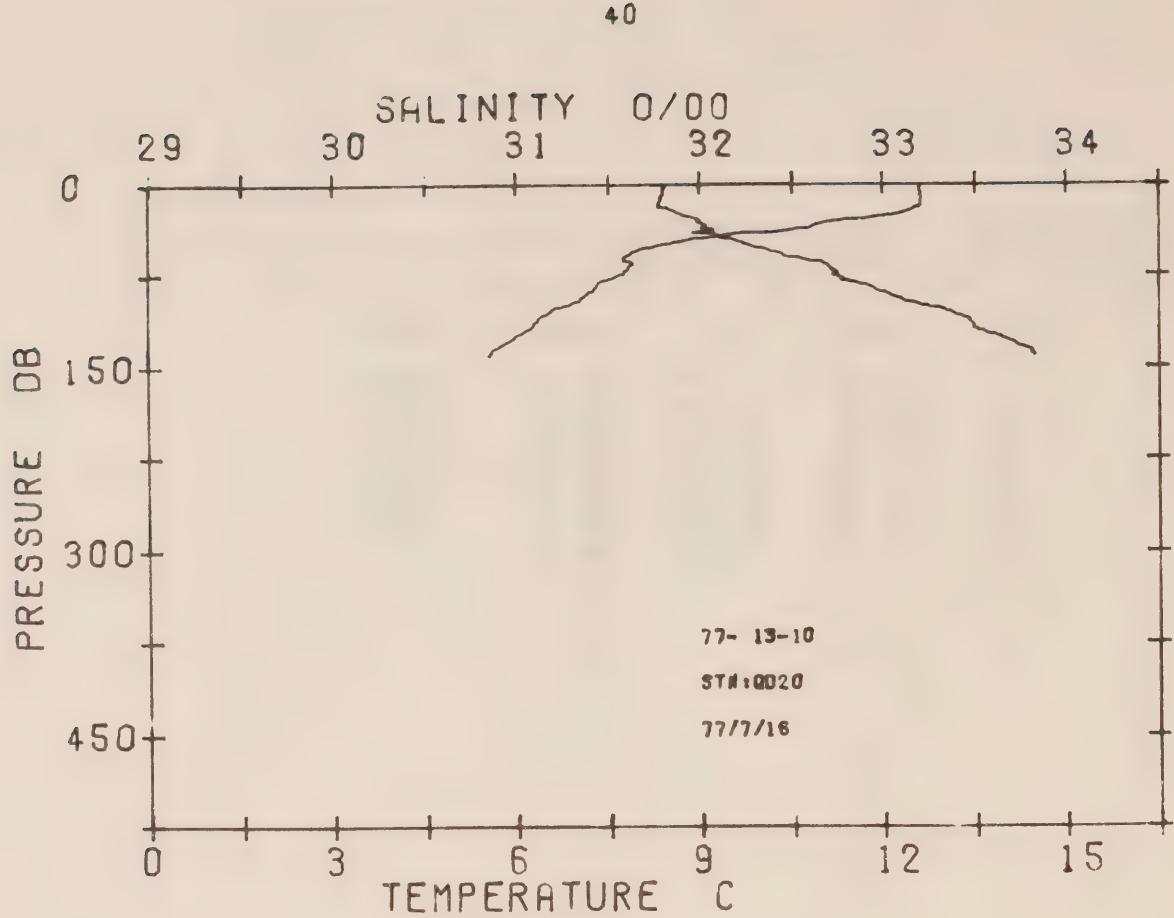


STATION QD20 CRUISE 77-13 CONS # 10
 POSITION 52-36. 5N 130-33. 5W
 DATE 77/ 7/16 TIME 1:33:58 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 60	31. 79	24. 01	1496.
10	12. 61	31. 79	24. 01	1496.
20	12. 49	31. 83	24. 06	1496.
30	11. 23	32. 01	24. 43	1492.
50	8. 39	32. 25	25. 08	1482.
75	7. 68	32. 73	25. 56	1480.
100	6. 76	33. 25	26. 10	1477.
125	5. 97	33. 65	26. 51	1475.

STATION QD12 CRUISE 77-13 CONS # 11
 POSITION 52-34. ON 129-53. 5W
 DATE 77/ 7/16 TIME 4: 2:31 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 54	32. 14	24. 48	1492.
10	11. 53	32. 15	24. 49	1492.
20	11. 13	32. 17	24. 58	1491.
30	9. 22	32. 38	25. 06	1485.
50	7. 56	32. 87	25. 69	1479.
75	7. 07	33. 12	25. 96	1478.
100	6. 52	33. 52	26. 34	1477.
125	6. 22	33. 72	26. 54	1476.
150	5. 86	33. 82	26. 66	1475.
175	5. 59	33. 91	26. 77	1475.
200	5. 28	33. 95	26. 83	1474.

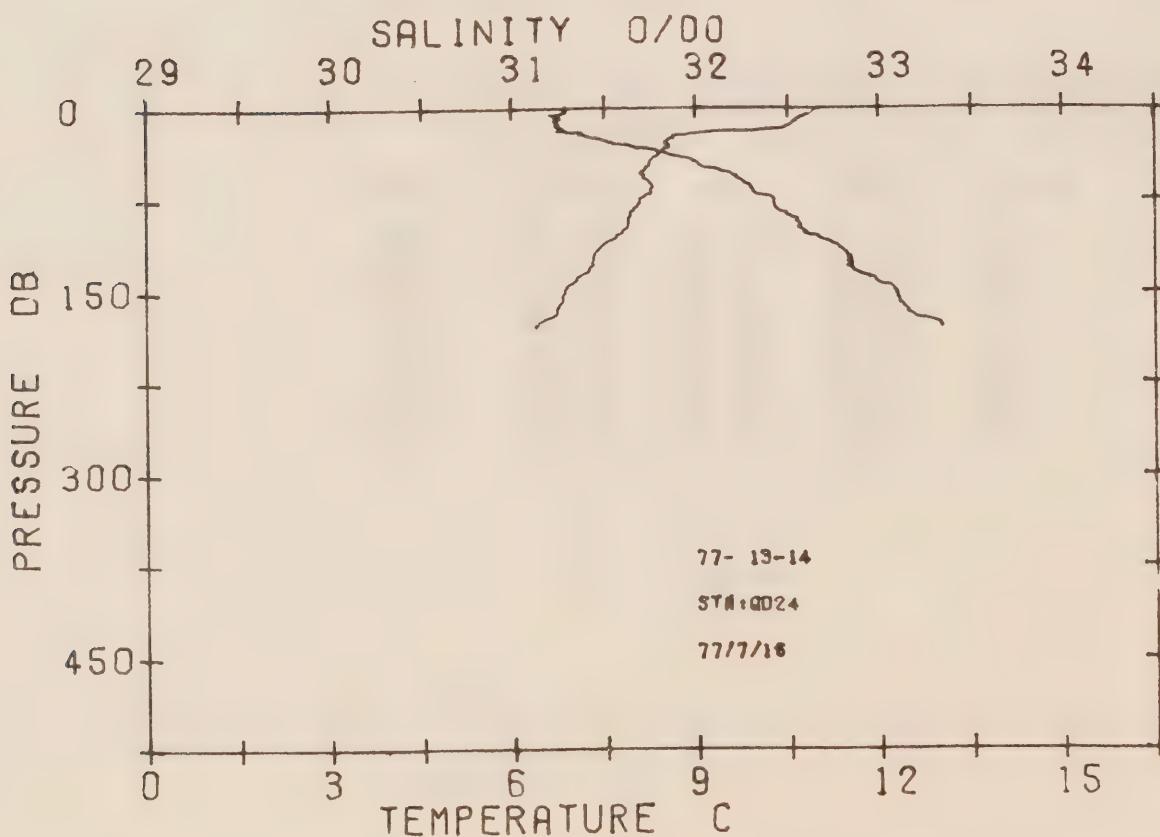
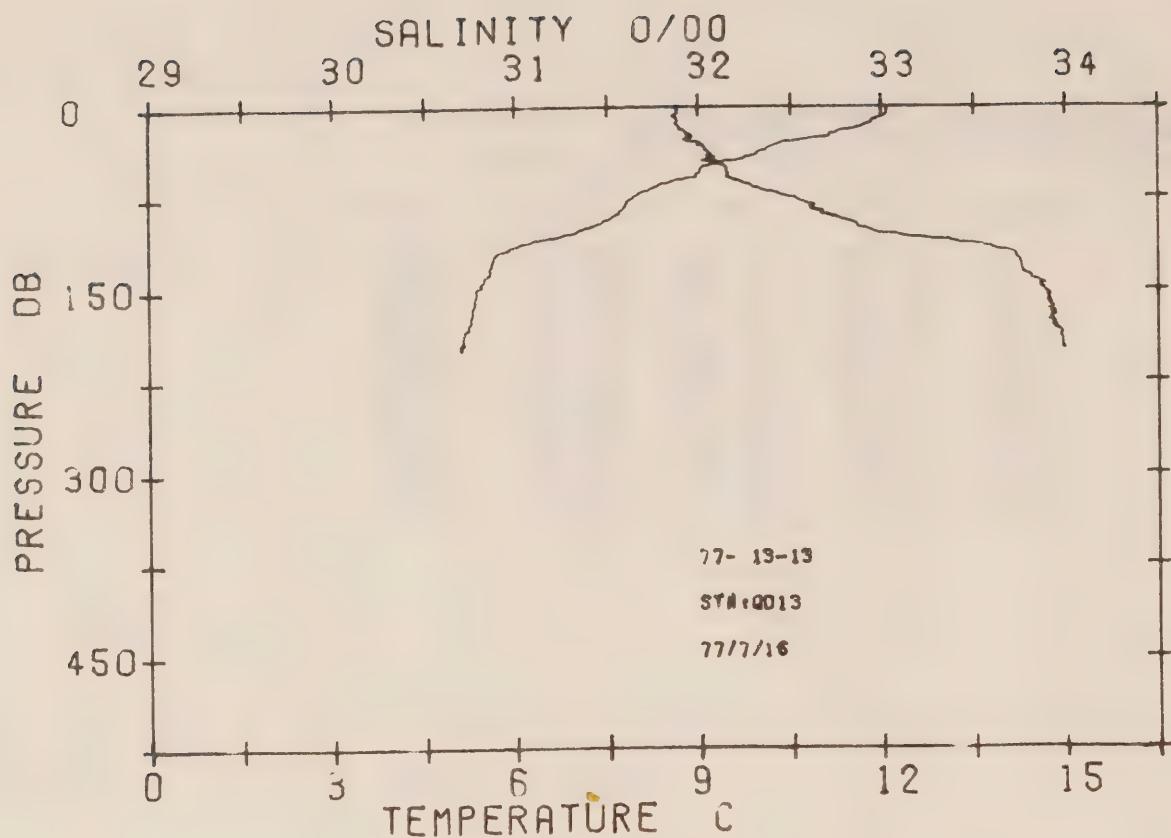


STATION QD13 CRUISE 77-13 CONS # 13
 POSITION 52-53. 5N 129-55. 9W
 DATE 77/ 7/16 TIME 8:37: 3 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 10	31. 88	24. 18	1494.
10	11. 91	31. 88	24. 21	1493.
20	11. 38	31. 91	24. 33	1492.
30	10. 32	32. 03	24. 60	1488.
50	9. 05	32. 16	24. 91	1484.
75	7. 91	32. 53	25. 37	1481.
100	7. 12	32. 92	25. 79	1478.
125	5. 63	33. 75	26. 63	1474.
150	5. 37	33. 89	26. 78	1474.
175	5. 27	33. 94	26. 83	1474.
200	5. 10	33. 99	26. 89	1473.

STATION QD24 CRUISE 77-13 CONS # 14
 POSITION 52-53. 5N 129-36. 0W
 DATE 77/ 7/16 TIME 13:12:31 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 04	31. 30	23. 91	1489.
10	10. 64	31. 26	23. 96	1488.
20	9. 36	31. 24	24. 14	1484.
30	8. 48	31. 56	24. 53	1481.
50	8. 18	32. 09	24. 99	1481.
75	8. 09	32. 43	25. 27	1481.
100	7. 83	32. 59	25. 43	1481.
125	7. 31	32. 85	25. 71	1479.
150	6. 85	33. 08	25. 95	1478.
175	6. 42	33. 31	26. 19	1477.

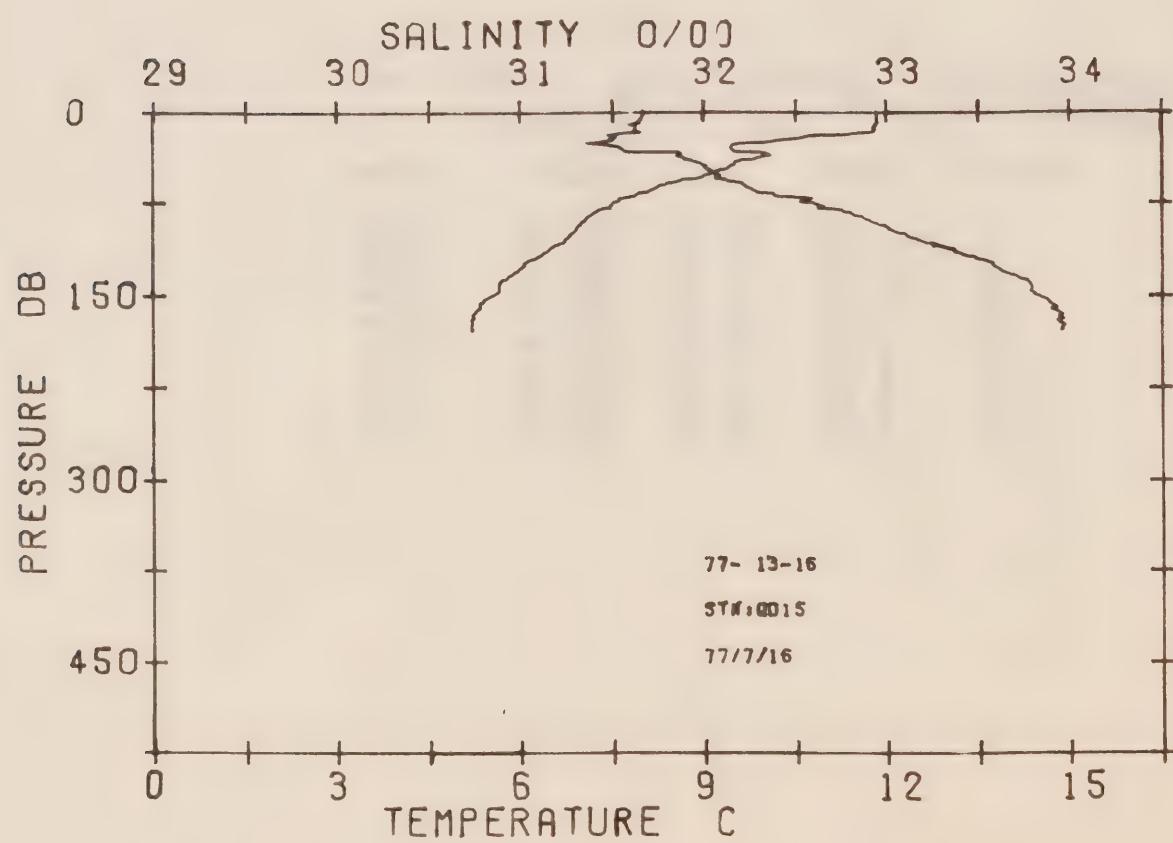
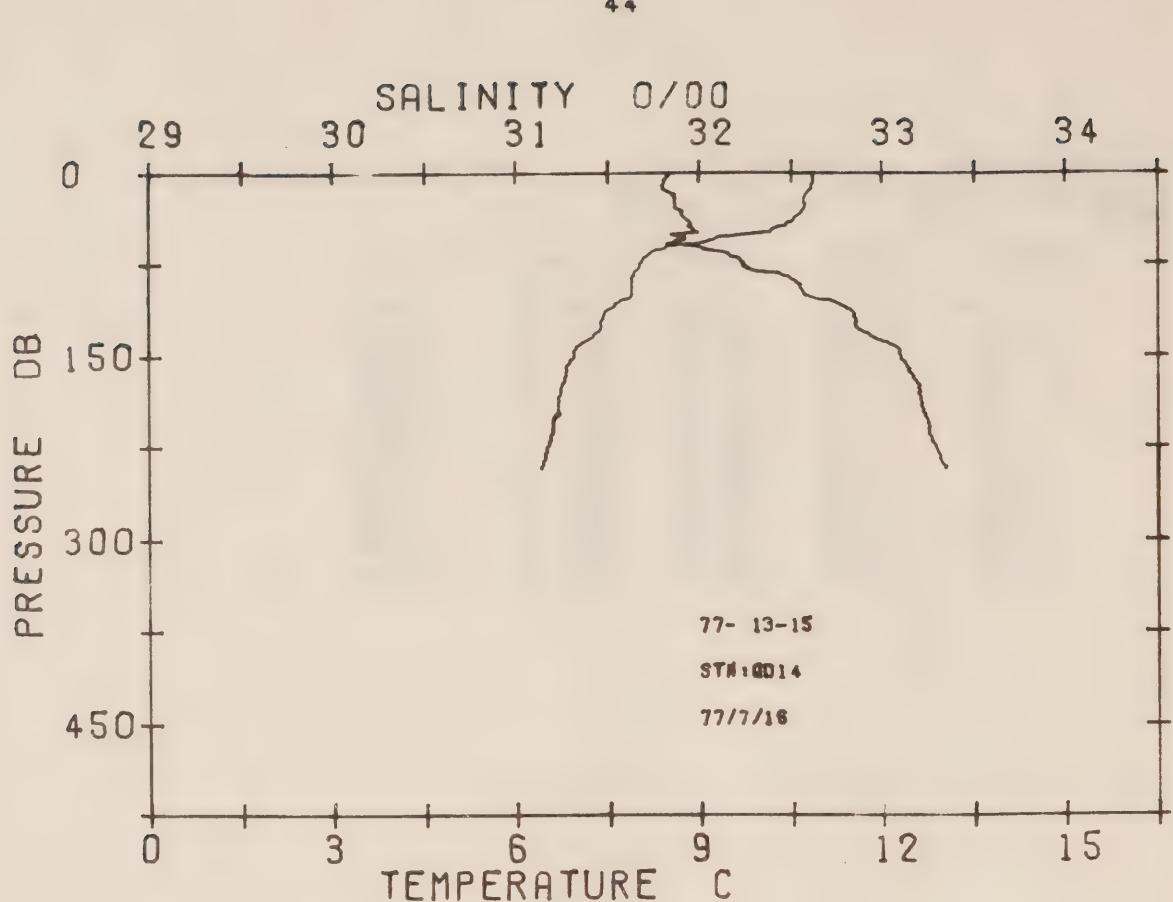


STATION QD14 CRUISE 77-13 CONS # 15
 POSITION 52-54. ON 129- 5W
 DATE 77/ 7/16 TIME 14:19: 4 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	10. 87	31. 84	24. 36	1490.
10	10. 83	31. 79	24. 34	1489.
20	10. 71	31. 86	24. 41	1489.
30	10. 71	31. 87	24. 42	1489.
50	10. 04	32. 00	24. 63	1488.
75	8. 02	32. 24	25. 13	1481.
100	7. 90	32. 57	25. 41	1481.
125	7. 39	32. 86	25. 70	1480.
150	6. 94	33. 10	25. 95	1479.
175	6. 72	33. 20	26. 06	1478.
200	6. 63	33. 24	26. 11	1479.
225	6. 51	33. 29	26. 16	1479.

STATION QD15 CRUISE 77-13 CONS # 16
 POSITION 53- 9. 5N 130-24. 0W
 DATE 77/ 7/16 TIME 21:50: 9 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 84	31. 67	24. 06	1493.
10	11. 83	31. 64	24. 04	1493.
20	10. 85	31. 47	24. 09	1489.
30	9. 44	31. 54	24. 37	1484.
50	9. 17	32. 05	24. 81	1484.
75	7. 50	32. 59	25. 48	1479.
100	6. 80	33. 11	25. 98	1477.
125	6. 06	33. 59	26. 46	1475.
150	5. 56	33. 82	26. 70	1474.
175	5. 22	33. 96	26. 85	1473.

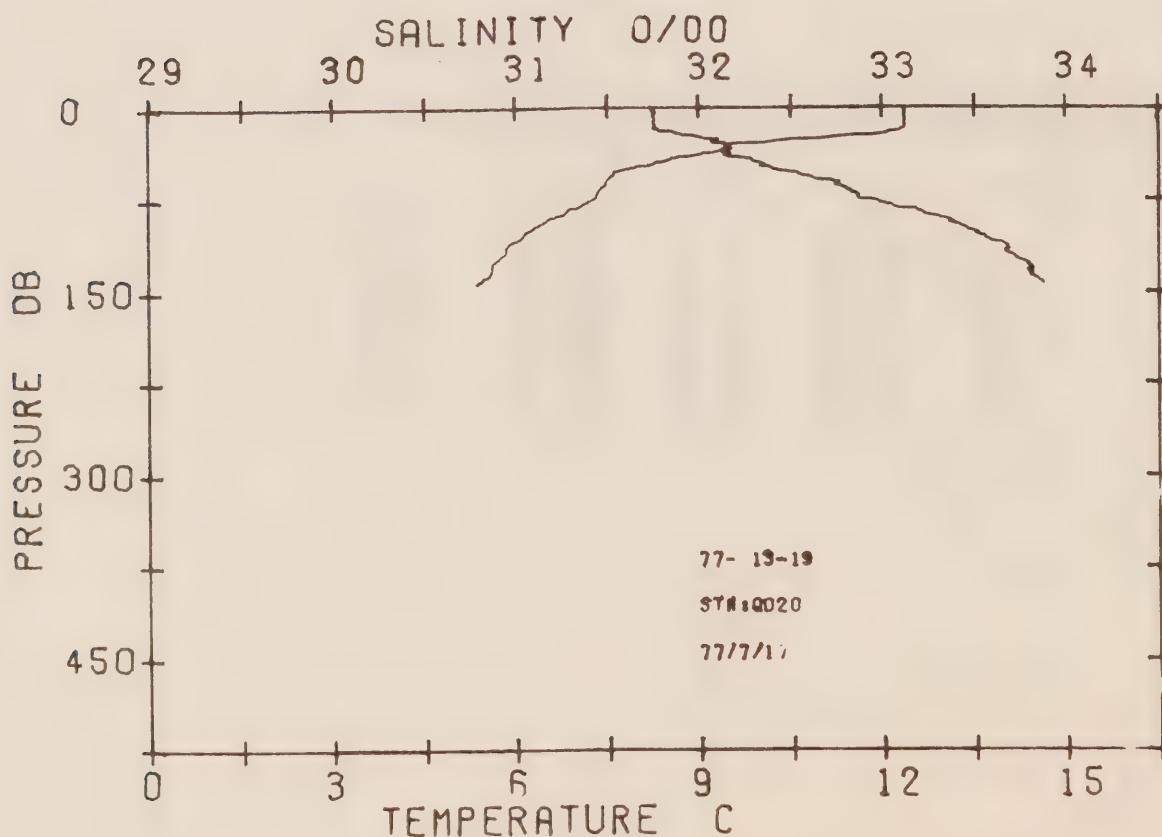
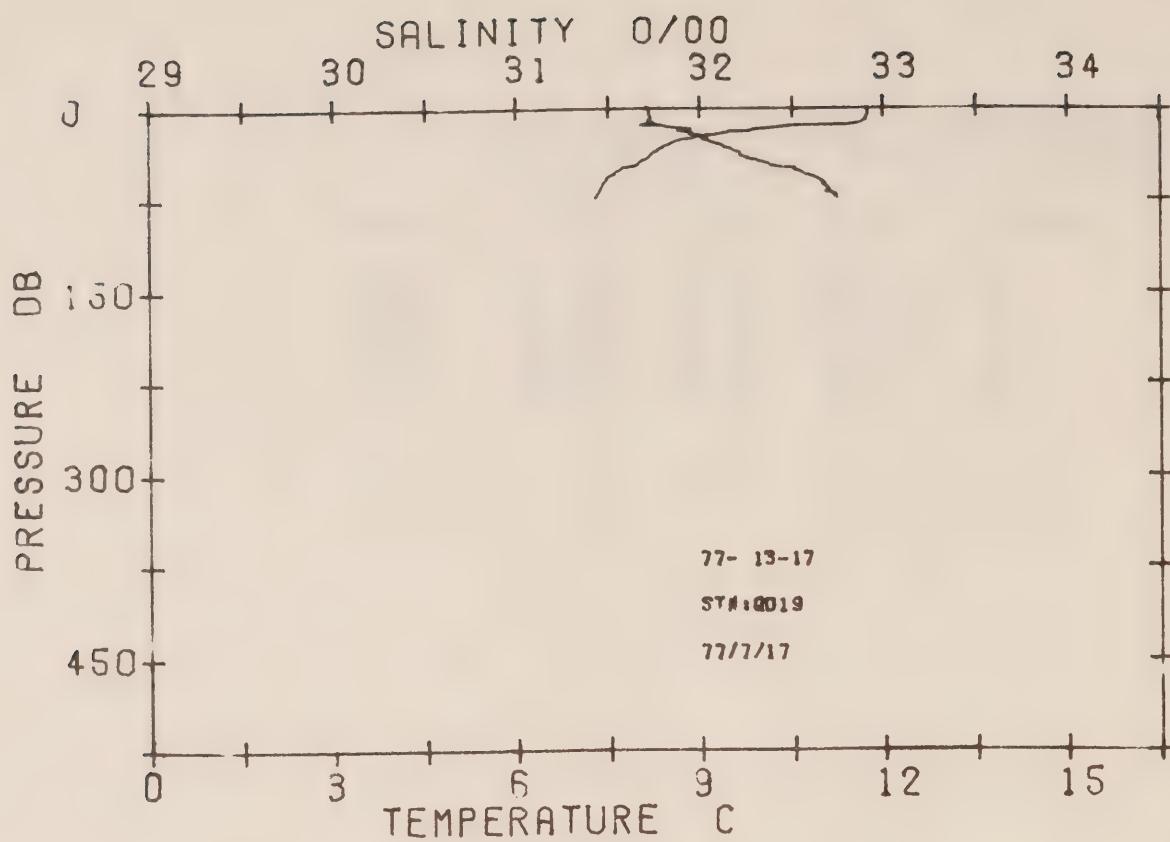


STATION QD19 CRUISE 77-13 CONS # 17
 POSITION 52-48. ON 130-46. 5W
 DATE 77/ 7/17 TIME 1:35:23 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 73	31. 72	24. 12	1492.
10	11. 72	31. 73	24. 13	1493.
20	9. 47	31. 91	24. 65	1485.
30	8. 51	32. 10	24. 95	1482.
50	7. 73	32. 52	25. 39	1479.
75	7. 30	32. 75	25. 63	1478.

STATION QD20 CRUISE 77-13 CONS # 19
 POSITION 52-36. 5N 130-33. 5W
 DATE 77/ 7/17 TIME 3:39:13 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 38	31. 75	24. 02	1495.
10	12. 38	31. 76	24. 03	1495.
20	12. 11	31. 87	24. 16	1494.
30	9. 40	32. 15	24. 85	1485.
50	7. 88	32. 40	25. 27	1480.
75	7. 25	32. 96	25. 80	1479.
100	6. 25	33. 48	26. 34	1476.
125	5. 69	33. 77	26. 64	1474.

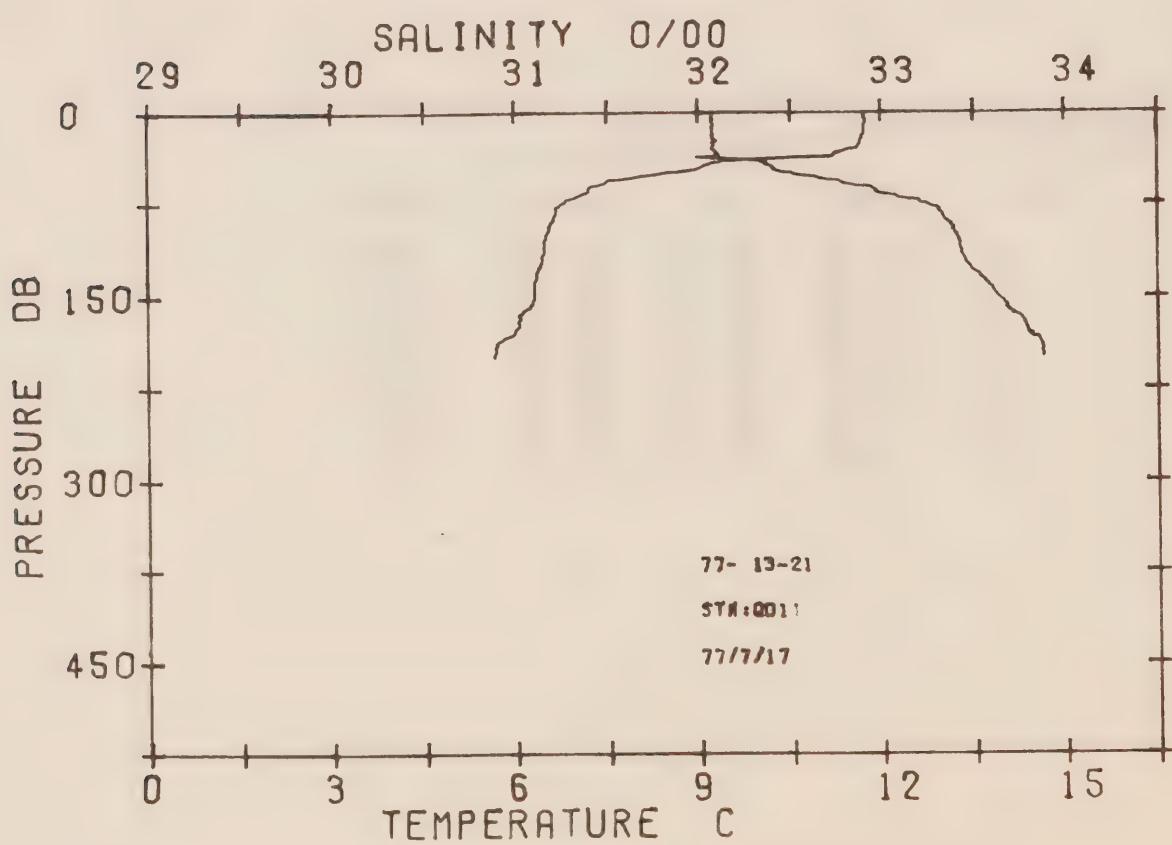
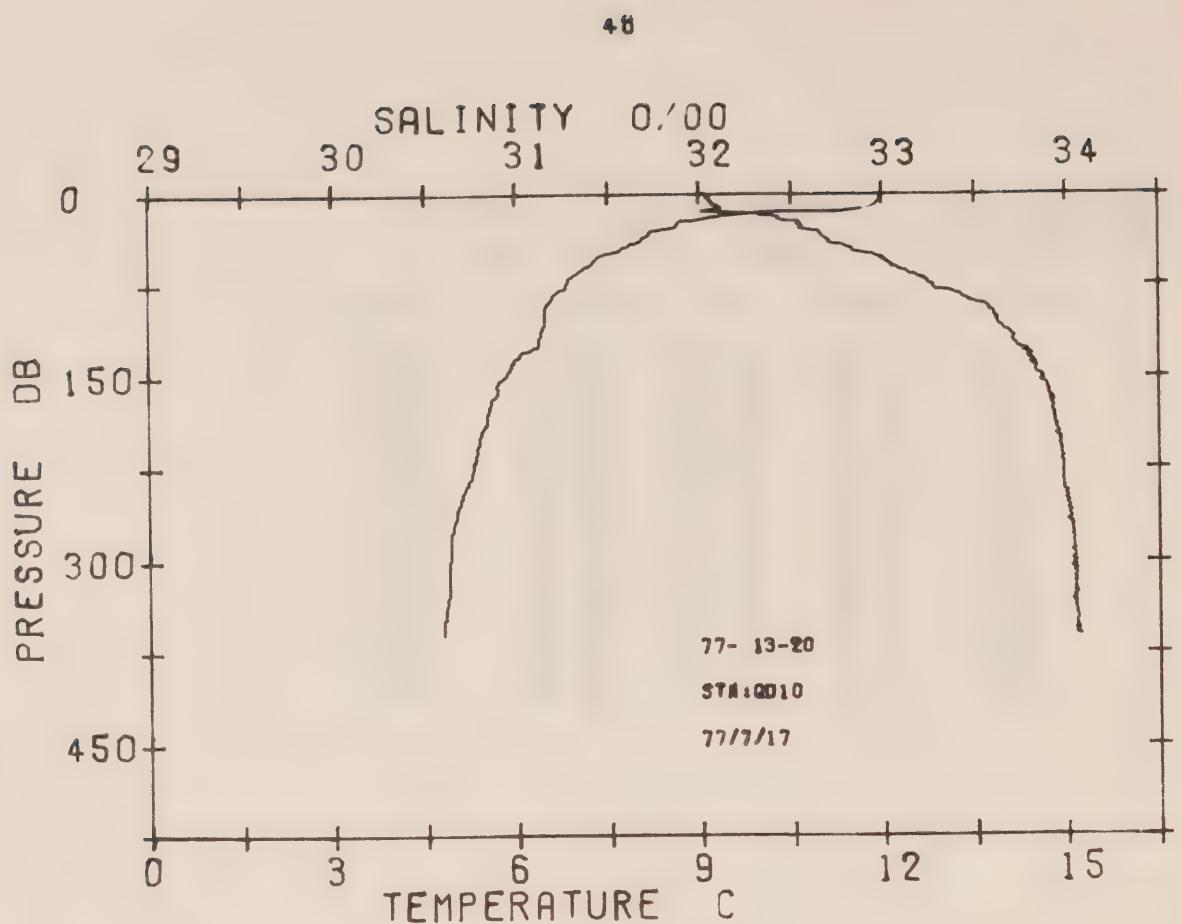


STATION QD10 CRUISE 77-13 CONS # 20
 POSITION 52-17. 7N 130-17. 0W
 DATE 77/ 7/17 TIME 6: 1:21 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 97	32. 04	24. 32	1494.
10	11. 85	32. 10	24. 39	1493.
20	9. 19	32. 44	25. 11	1484.
30	8. 28	32. 63	25. 40	1481.
50	7. 43	32. 95	25. 77	1479.
75	6. 81	33. 28	26. 12	1477.
100	6. 47	33. 61	26. 42	1477.
125	6. 36	33. 74	26. 53	1477.
150	5. 83	33. 88	26. 71	1475.
175	5. 56	33. 93	26. 78	1475.
200	5. 38	33. 97	26. 84	1474.
225	5. 29	33. 98	26. 86	1475.
250	5. 08	34. 00	26. 90	1474.
275	4. 94	34. 04	26. 95	1474.
300	4. 90	34. 05	26. 96	1474.

STATION QD11 CRUISE 77-13 CONS # 21
 POSITION 52-20. ON 129-40. 0W
 DATE 77/ 7/17 TIME 12: 20: 44 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 70	32. 08	24. 40	1493.
10	11. 73	32. 08	24. 40	1493.
20	11. 69	32. 08	24. 40	1493.
30	11. 58	32. 07	24. 42	1493.
50	8. 48	32. 52	25. 28	1482.
75	6. 75	33. 25	26. 10	1477.
100	6. 49	33. 40	26. 25	1477.
125	6. 41	33. 48	26. 32	1477.
150	6. 30	33. 64	26. 46	1477.
175	6. 04	33. 79	26. 62	1476.

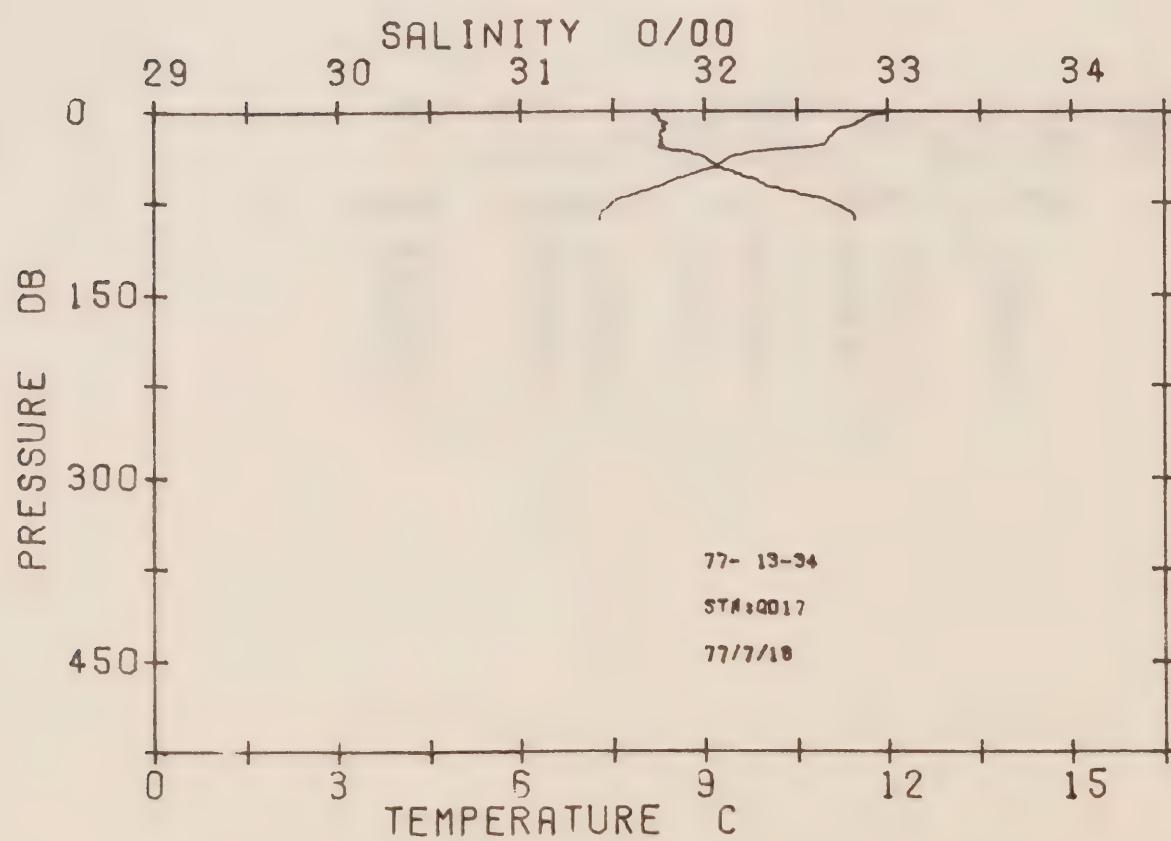
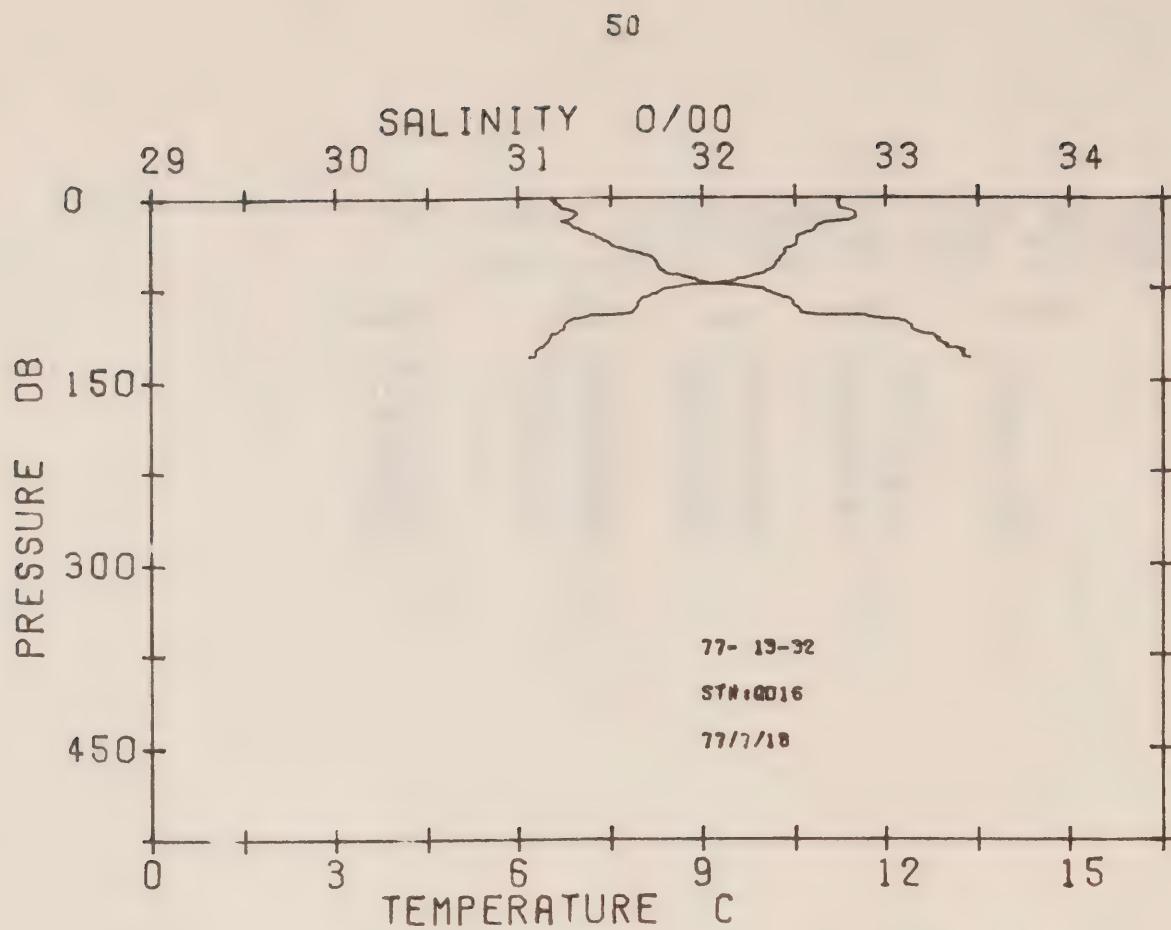


STATION QD16 CRUISE 77-13 CONS # 32
POSITION 53-27. 5N 130-45. 0W
DATE 77/ 7/18 TIME 20:19: 0 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	11. 22	31. 18	23. 80	1490.
10	11. 37	31. 28	23. 84	1491.
20	11. 28	31. 23	23. 82	1491.
30	10. 67	31. 40	24. 06	1489.
50	10. 27	31. 74	24. 39	1488.
75	8. 39	32. 33	25. 15	1482.
100	6. 88	33. 07	25. 94	1478.
125	6. 31	33. 43	26. 30	1476.

STATION QD17 CRUISE 77-13 CONS # 34
POSITION 53-13. 5N 130-53. 0W
DATE 77/ 7/18 TIME 22:11:32 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 95	31. 73	24. 09	1493.
10	11. 48	31. 78	24. 21	1492.
20	11. 09	31. 75	24. 26	1491.
30	10. 75	31. 77	24. 34	1489.
50	8. 95	32. 14	24. 91	1484.
75	7. 51	32. 69	25. 56	1479.

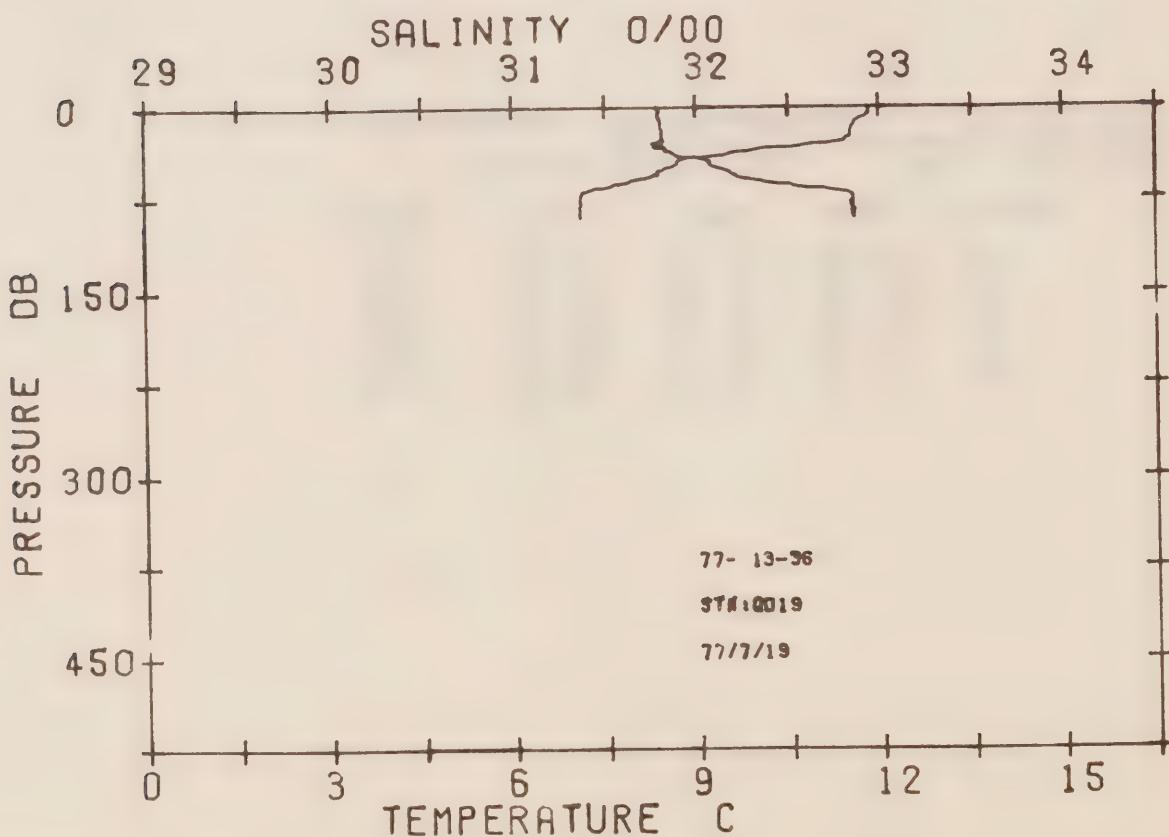
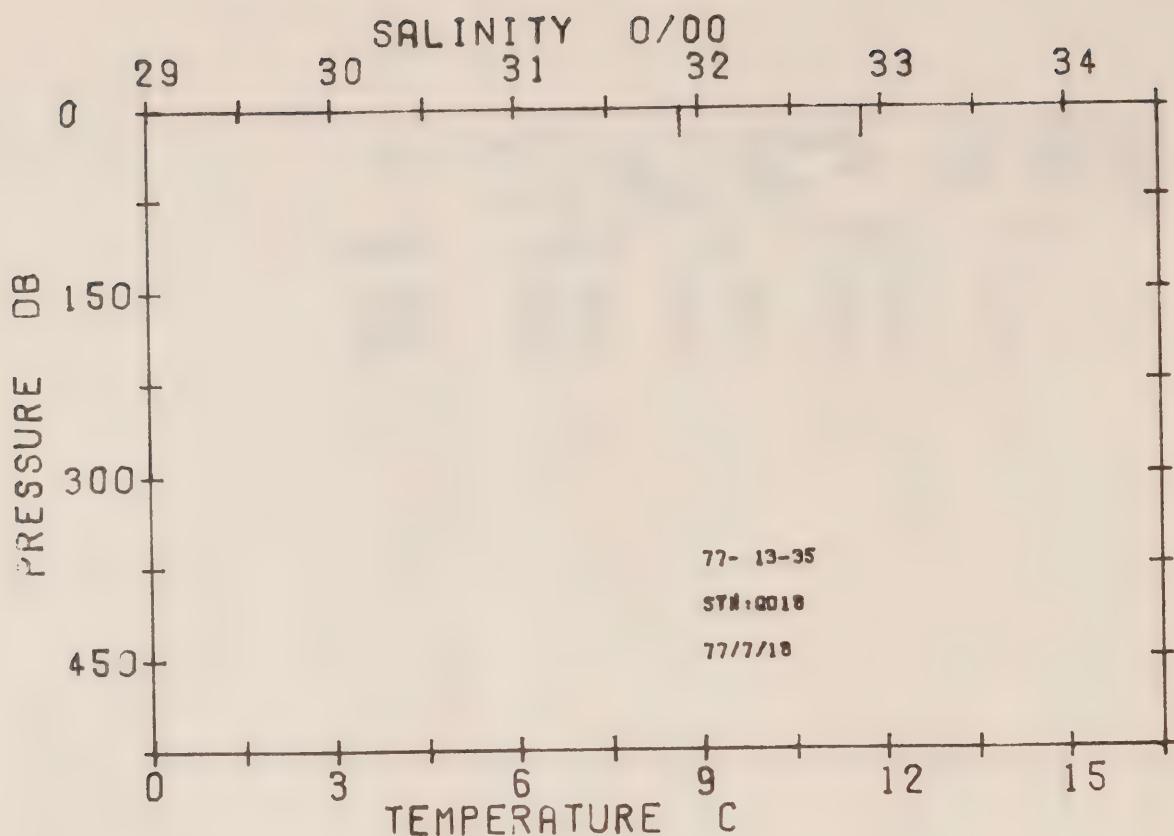


STATION QD18 CRUISE 77-13 CONS # 35
POSITION 53- . ON 131- OW
DATE 77/ 7/18 TIME 23:52:44 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11.69	31.90	24.27	1492.
10	11.69	31.90	24.27	1493.
20	11.68	31.90	24.27	1493.

STATION QD19 CRUISE 77-13 CONS # 36
POSITION 52-48. ON 130-46.5W
DATE 77/ 7/19 TIME 1:30:20 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	11.83	31.79	24.15	1493.
10	11.67	31.80	24.19	1492.
20	11.52	31.82	24.23	1492.
30	11.11	31.75	24.26	1491.
50	8.54	32.11	24.95	1482.
75	7.11	32.86	25.74	1478.

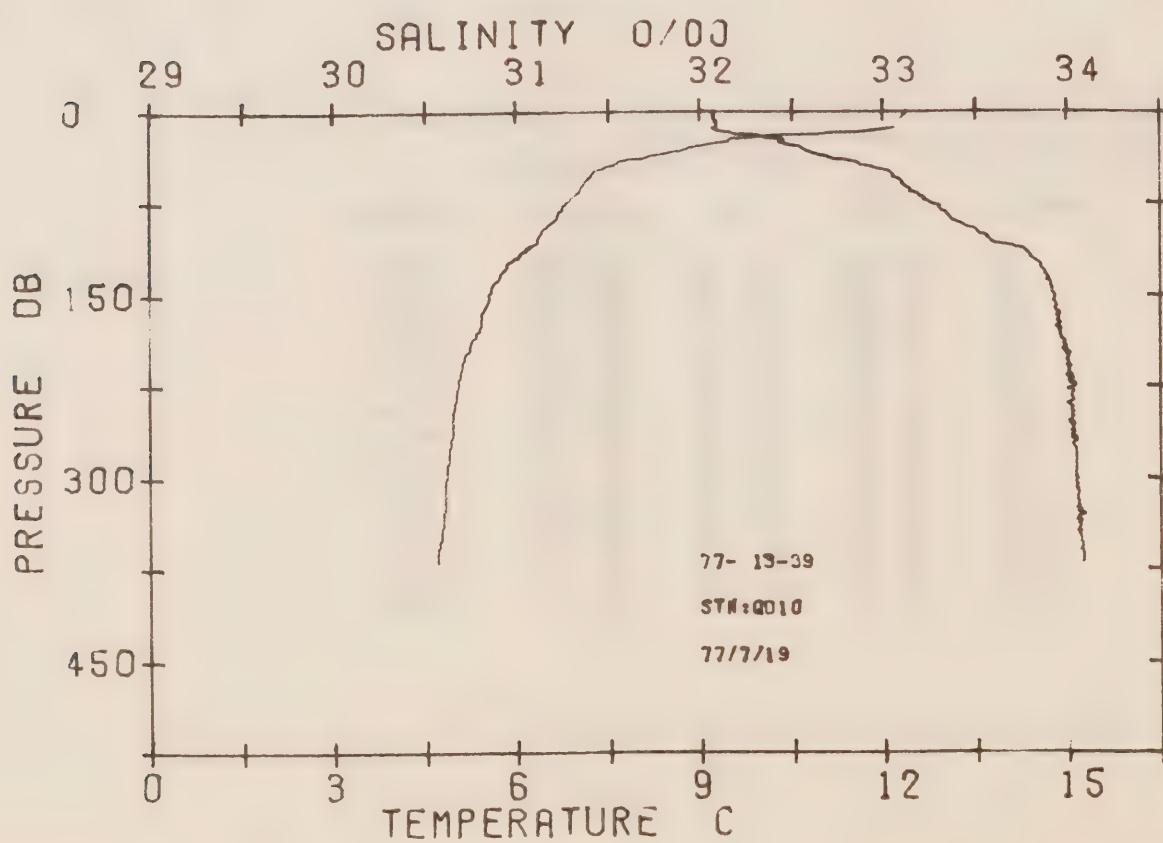
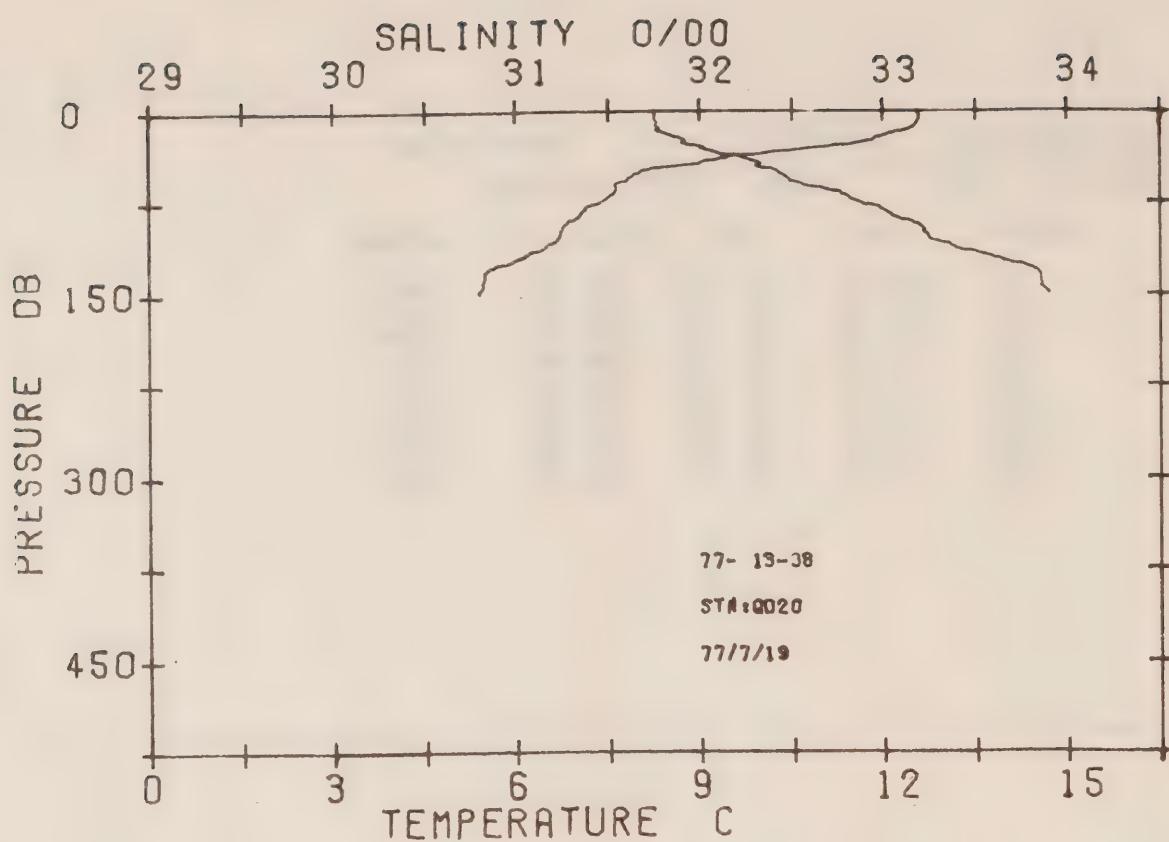


STATION QD20 CRUISE 77-13 CONS # 38
 POSITION 52-36. 5N 130-33. 5W
 DATE 77/ 7/19 TIME 3:13:35 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 57	31. 75	23. 99	1495.
10	12. 56	31. 77	24. 00	1495.
20	12. 10	31. 82	24. 13	1494.
30	11. 04	32. 03	24. 48	1491.
50	8. 04	32. 42	25. 27	1481.
75	7. 41	32. 85	25. 70	1479.
100	6. 73	33. 22	26. 08	1477.
125	5. 92	33. 68	26. 55	1475.
150	5. 40	33. 90	26. 78	1474.

STATION QD10 CRUISE 77-13 CONS # 39
 POSITION 52-16. 5N 130-16. 0W
 DATE 77/ 7/19 TIME 5:11:31 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 38	32. 08	24. 28	1495.
10	12. 20	32. 09	24. 32	1495.
20	10. 35	32. 28	24. 79	1489.
30	8. 85	32. 56	25. 26	1483.
50	7. 26	33. 04	25. 87	1478.
75	6. 82	33. 26	26. 09	1477.
100	6. 40	33. 53	26. 36	1476.
125	5. 85	33. 86	26. 70	1475.
150	5. 55	33. 93	26. 79	1474.
175	5. 41	33. 95	26. 82	1474.
200	5. 15	33. 99	26. 88	1474.
225	5. 03	34. 04	26. 94	1474.
250	4. 96	34. 03	26. 93	1474.
275	4. 91	34. 04	26. 95	1474.
300	4. 84	34. 06	26. 97	1474.

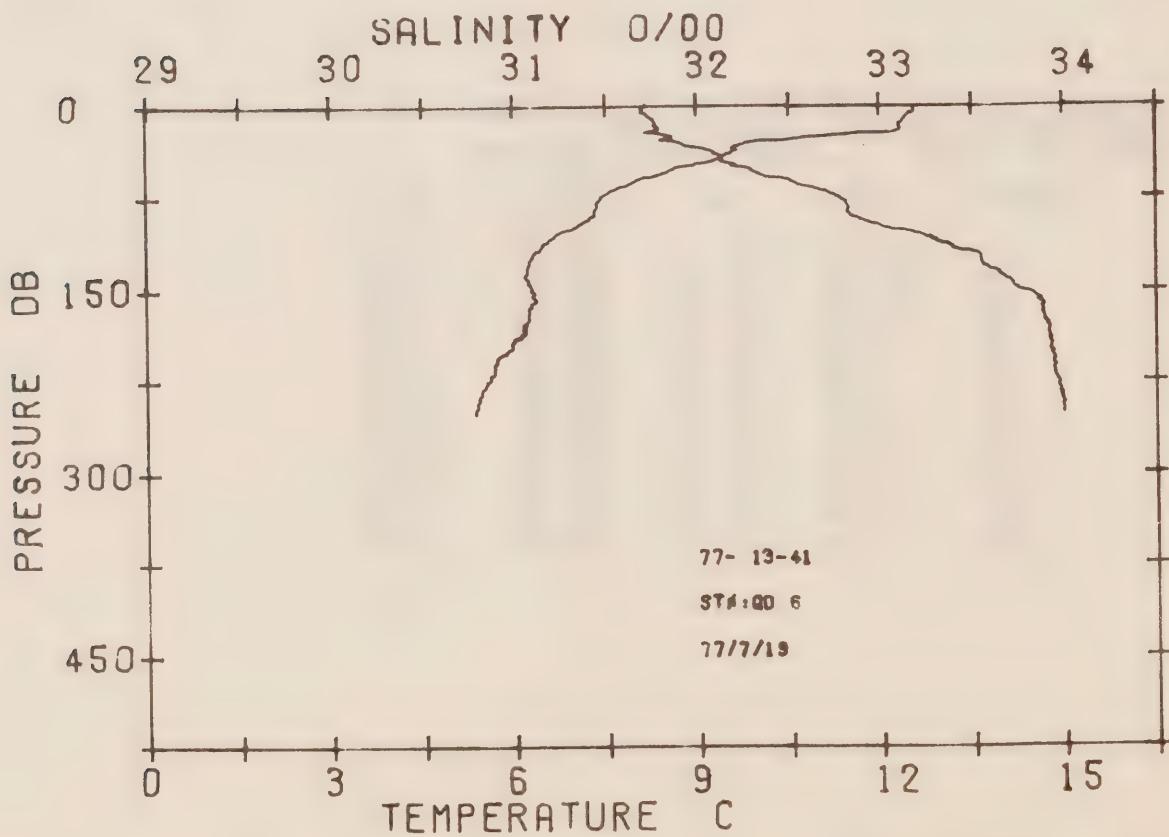
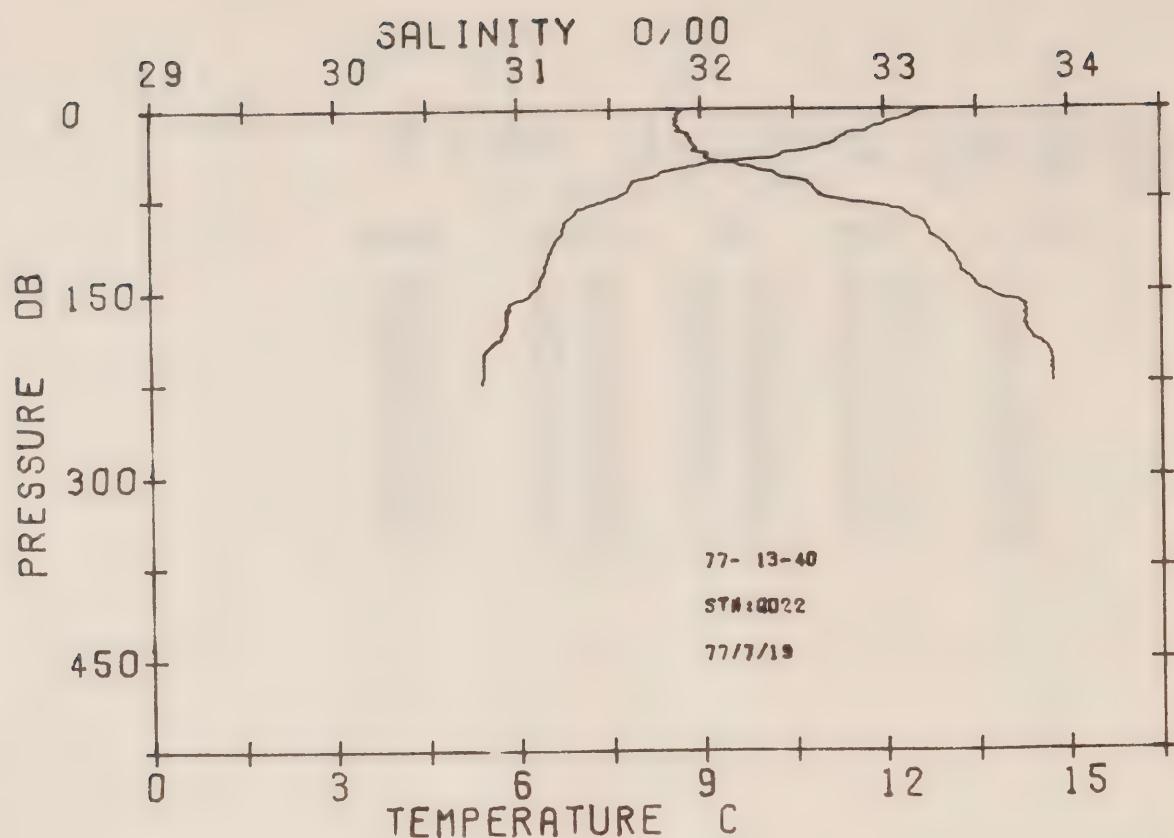


STATION QD22 CRUISE 77-13 CONS # 40
 POSITION 51-56. ON 129-31. SW
 DATE 77/ 7/19 TIME 8:31:38 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 68	31. 82	24. 02	1496.
10	12. 11	31. 86	24. 16	1494.
20	11. 45	31. 89	24. 30	1492.
30	11. 08	31. 95	24. 41	1491.
50	8. 69	32. 29	25. 07	1483.
75	7. 49	32. 71	25. 58	1479.
100	6. 72	33. 25	26. 10	1477.
125	6. 47	33. 40	26. 25	1477.
150	6. 23	33. 58	26. 43	1477.
175	5. 81	33. 76	26. 62	1476.
200	5. 43	33. 91	26. 78	1475.
225	5. 41	33. 92	26. 79	1475.

STATION QD 6 CRUISE 77-13 CONS # 41
 POSITION 51-22. 5N 130- 1. 0W
 DATE 77/ 7/19 TIME 19: 6:50 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 56	31. 72	23. 96	1495.
10	12. 41	31. 74	24. 01	1495.
20	12. 34	31. 80	24. 07	1495.
30	9. 84	31. 91	24. 59	1486.
50	8. 84	32. 19	24. 97	1483.
75	7. 42	32. 78	25. 64	1479.
100	6. 97	33. 05	25. 91	1478.
125	6. 29	33. 55	26. 40	1476.
150	6. 31	33. 75	26. 55	1477.
175	6. 25	33. 90	26. 68	1477.
200	5. 90	33. 93	26. 74	1477.
225	5. 54	33. 97	26. 82	1476.
250	5. 36	34. 00	26. 87	1475.

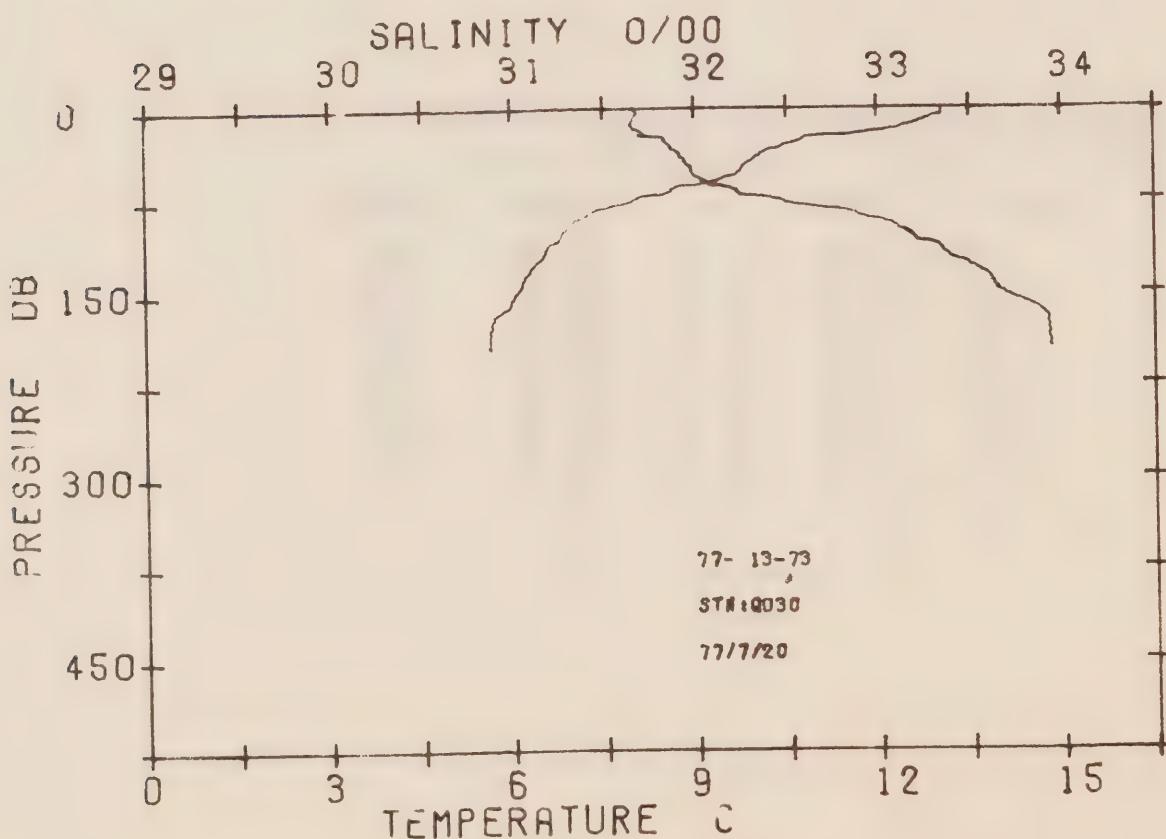
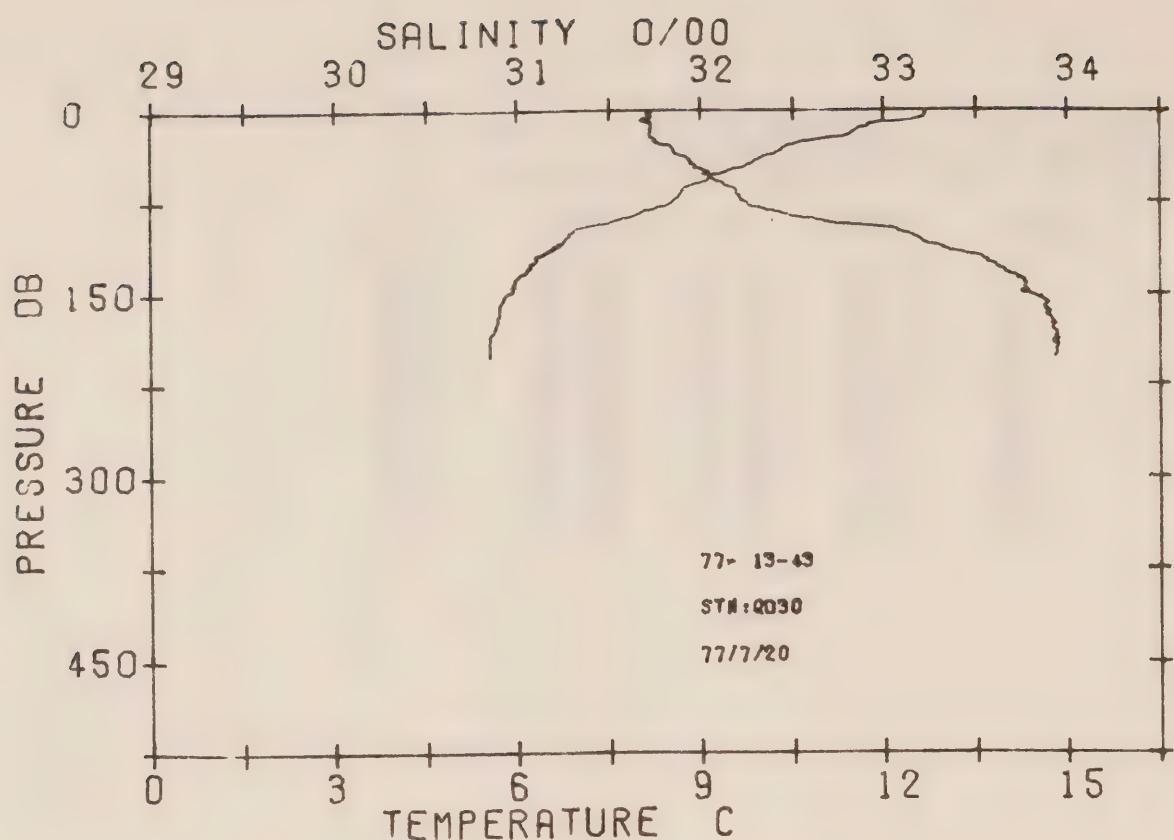


STATION QD30 CRUISE 77-13 CONS # 43
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 0: 9: 59 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 67	31. 73	23. 95	1496.
10	11. 95	31. 73	24. 09	1493.
20	11. 46	31. 72	24. 17	1492.
30	10. 36	31. 85	24. 46	1488.
50	9. 42	32. 03	24. 75	1485.
75	8. 56	32. 24	25. 05	1483.
100	6. 91	33. 10	25. 96	1478.
125	6. 28	33. 57	26. 41	1476.
150	5. 91	33. 77	26. 62	1476.
175	5. 67	33. 94	26. 78	1475.
200	5. 54	33. 95	26. 80	1475.

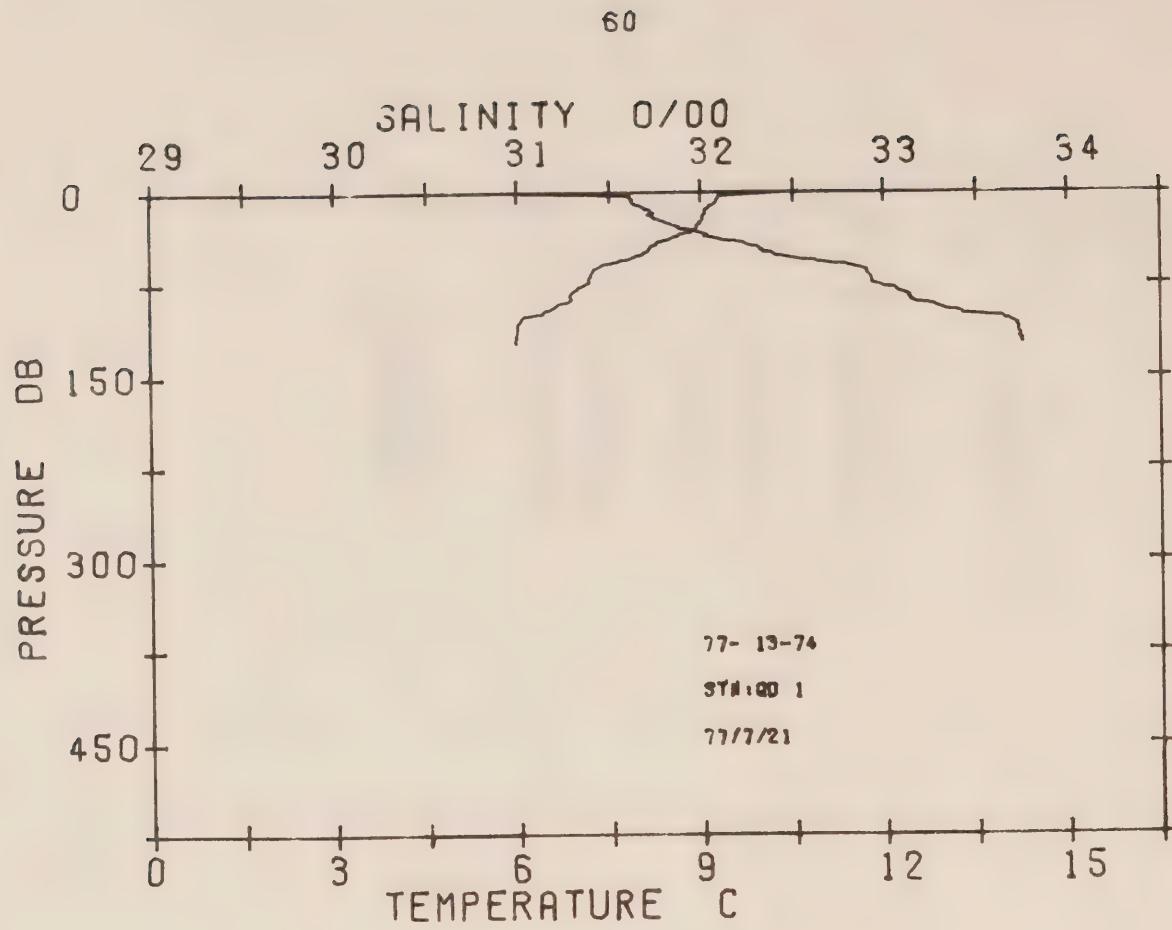
STATION QD30 CRUISE 77-13 CONS # 73
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 22: 5: 2 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13. 06	31. 68	23. 83	1497.
10	12. 79	31. 66	23. 88	1496.
20	11. 95	31. 71	24. 07	1493.
30	10. 49	31. 86	24. 45	1489.
50	9. 77	31. 99	24. 67	1487.
75	8. 01	32. 47	25. 31	1481.
100	6. 87	33. 15	26. 01	1478.
125	6. 44	33. 46	26. 31	1477.
150	6. 10	33. 68	26. 52	1476.
175	5. 68	33. 93	26. 77	1475.



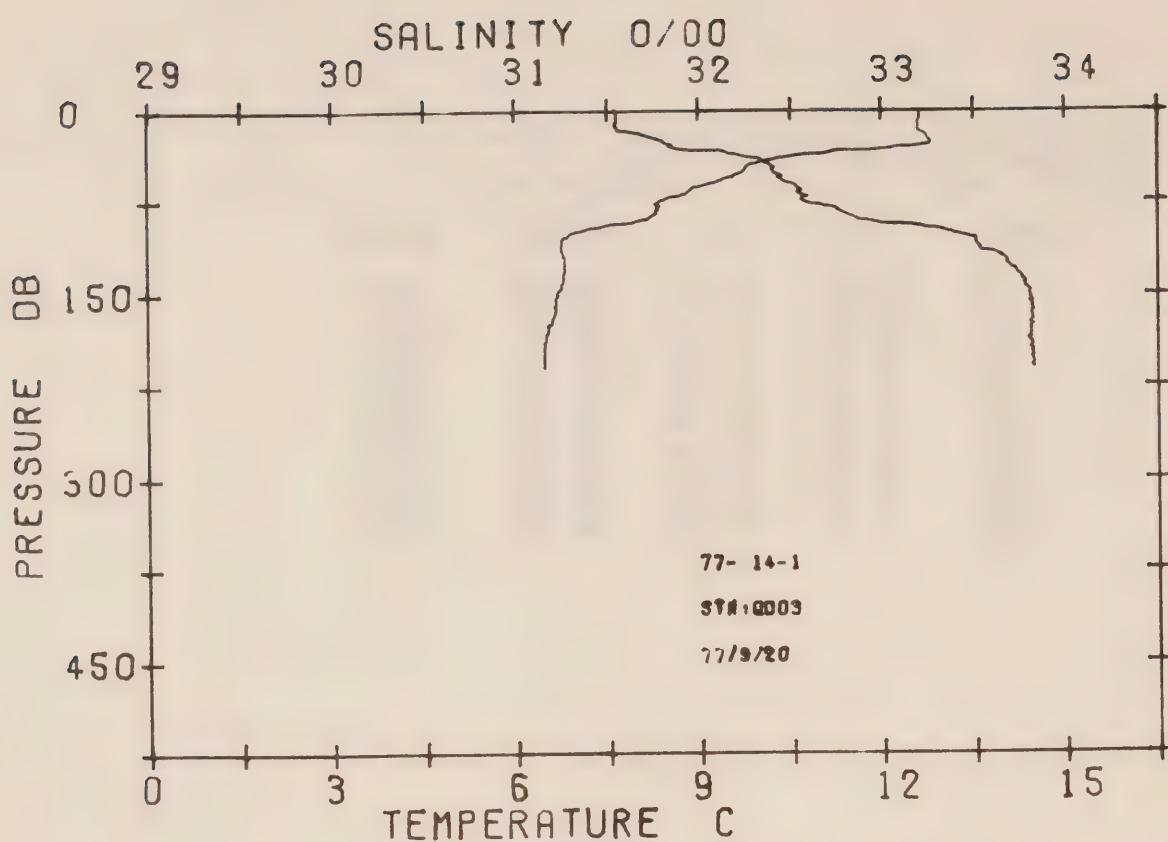
STATION QD 1 CRUISE 77-13 CONS # 74
POSITION 51° 1.2N 127° 54.6W
DATE 77/ 7/21 TIME 1:55:51 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11.06	30.60	23.37	1489.
10	9.20	31.63	24.48	1483.
20	9.04	31.72	24.57	1483.
30	8.91	31.89	24.72	1483.
50	8.07	32.38	25.24	1481.
75	7.14	32.94	25.80	1478.
100	6.29	33.49	26.35	1476.



STATION QD03 CRUISE 77-14 CONS # 1
POSITION 51-15. ON 129- 3. OW
DATE 77/ 9/20 TIME 9:36:14 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 63	31. 55	23. 82	1495.
10	12. 60	31. 55	23. 83	1495.
20	12. 71	31. 69	23. 91	1496.
30	12. 47	31. 84	24. 07	1496.
50	9. 75	32. 40	24. 99	1487.
75	8. 34	32. 56	25. 34	1482.
100	6. 97	33. 39	26. 18	1478.
125	6. 80	33. 69	26. 43	1479.
150	6. 69	33. 81	26. 55	1479.
175	6. 56	33. 83	26. 58	1479.
200	6. 46	33. 83	26. 59	1479.

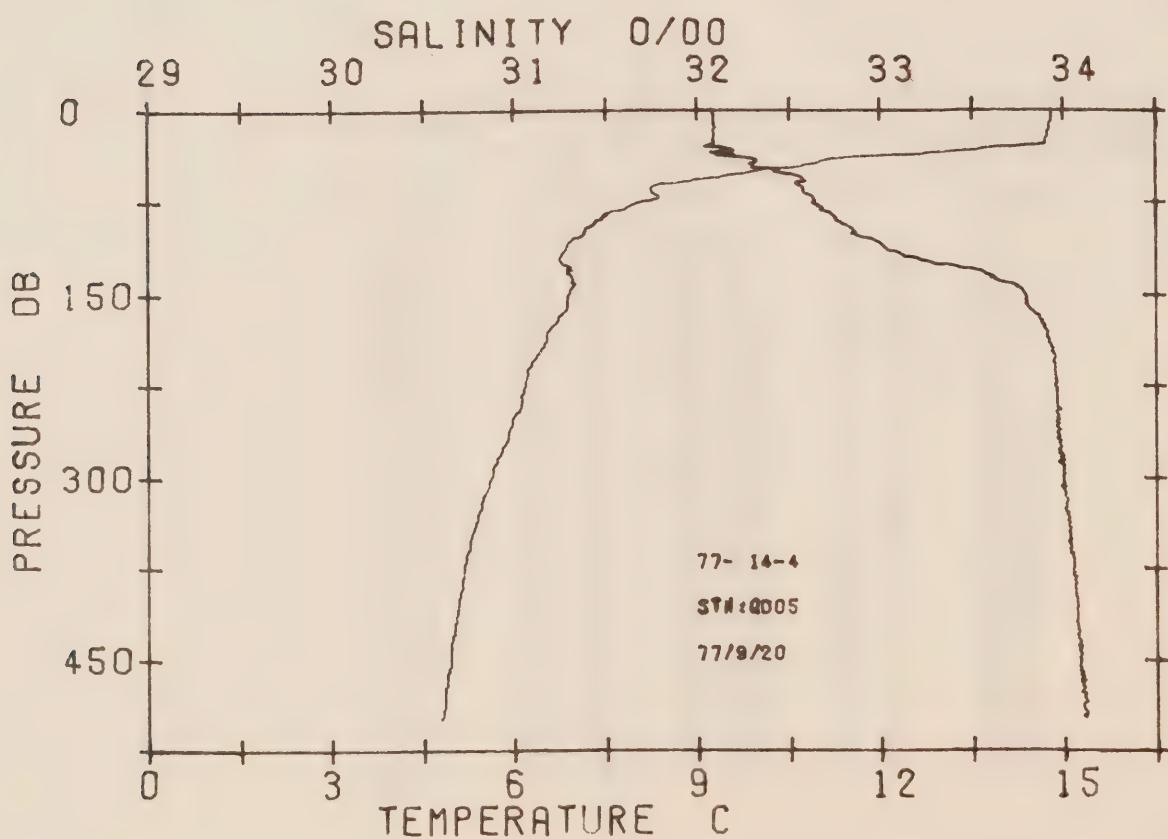
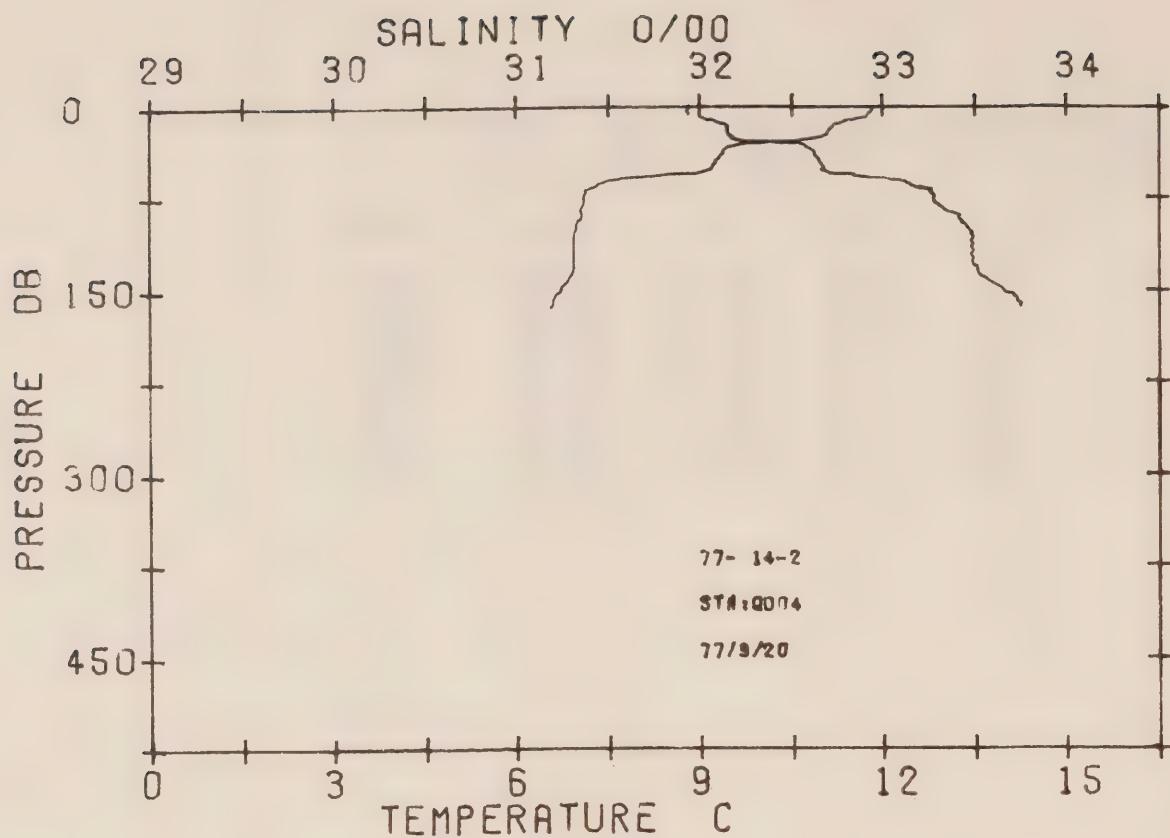


STATION QD04 CRUISE 77-14 CONS # 2
 POSITION 51- . ON 129-17.0W
 DATE 77/ 9/20 TIME 11:27: 9 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	11.82	31.95	24.28	1493
10	11.60	32.02	24.37	1492
20	11.12	32.15	24.56	1491
30	9.96	32.44	24.99	1487
50	9.20	32.68	25.29	1485
75	7.11	33.28	26.08	1478
100	6.96	33.47	26.24	1479
125	6.95	33.49	26.26	1479
150	6.72	33.66	26.42	1479

STATION QD05 CRUISE 77-14 CONS # 4
 POSITION 51- . ON 130- 5.0W
 DATE 77/ 9/20 TIME 15:42:30 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	14.79	32.08	23.79	1503
10	14.79	32.09	23.80	1503
20	14.75	32.09	23.81	1503
30	14.20	32.03	23.88	1502
50	10.00	32.42	24.96	1488
75	8.12	32.65	25.44	1482
100	7.14	32.87	25.74	1478
125	6.78	33.29	26.13	1478
150	6.89	33.79	26.51	1479
175	6.63	33.90	26.62	1479
200	6.37	33.95	26.70	1478
225	6.17	33.96	26.73	1478
250	5.98	33.97	26.76	1478
275	5.81	33.98	26.80	1477
300	5.62	34.00	26.83	1477
400	5.09	34.07	26.95	1477
500	4.80	34.13	27.03	1477
600	4.45	34.18	27.12	1477
700	4.24	34.26	27.20	1478
800	3.99	34.31	27.26	1479
900	3.71	34.34	27.31	1479
1000	3.52	34.38	27.37	1480
1200	3.10	34.47	27.47	1482

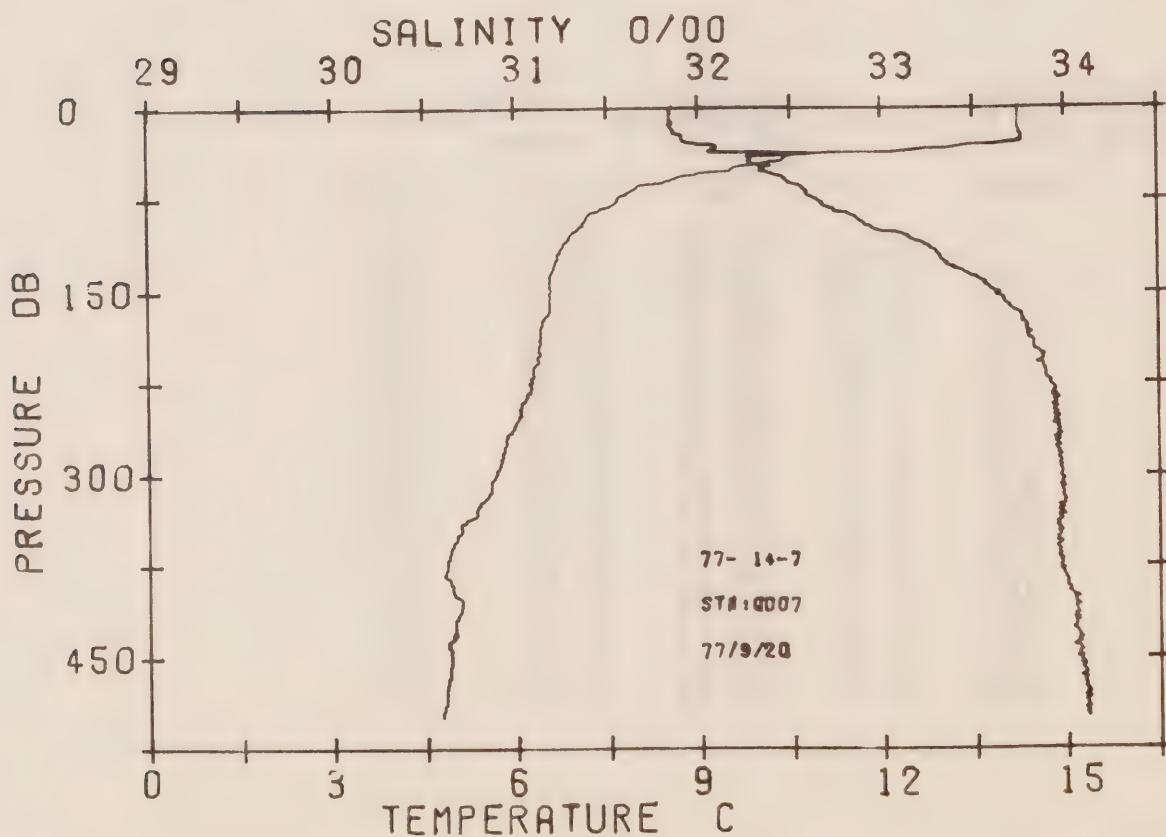
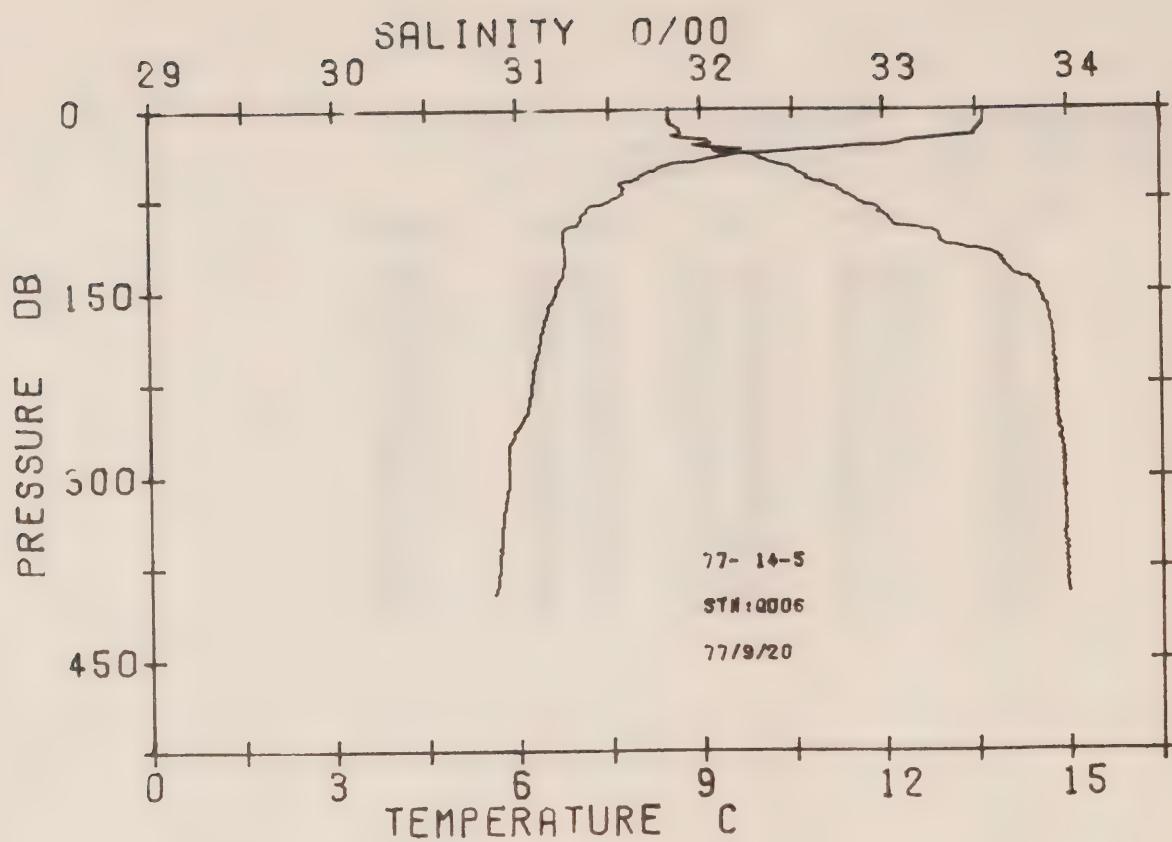


STATION QD06 CRUISE 77-14 CONS # 5
 POSITION 51-20. ON 130-3. OW
 DATE 77/ 9/20 TIME 19:38:10 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13.65	31.83	23.84	1499
10	13.65	31.82	23.83	1499
20	13.49	31.89	23.92	1499
30	12.01	31.99	24.28	1494
50	8.29	32.51	25.30	1482
75	7.53	32.85	25.68	1480
100	6.76	33.27	26.11	1477
125	6.78	33.64	26.40	1478
150	6.62	33.84	26.58	1478
175	6.43	33.90	26.65	1478
200	6.33	33.92	26.69	1478
225	6.22	33.94	26.71	1478
250	6.11	33.95	26.73	1478
275	5.84	33.97	26.78	1478
300	5.83	33.97	26.78	1478

STATION QD07 CRUISE 77-14 CONS # 7
 POSITION 51-25. ON 130-35. OW
 DATE 77/ 9/20 TIME 22: 0: 5 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	14.23	31.86	23.74	1501
10	14.23	31.85	23.73	1501
20	14.26	31.87	23.74	1501
30	13.79	32.01	23.94	1500
50	9.54	32.35	24.98	1486
75	7.66	32.65	25.50	1480
100	7.01	32.97	25.85	1478
125	6.67	33.34	26.18	1478
150	6.55	33.62	26.42	1478
175	6.44	33.76	26.54	1478
200	6.40	33.86	26.63	1478
225	6.21	33.91	26.69	1478
250	6.08	33.95	26.74	1478
275	5.82	33.95	26.77	1477
300	5.65	33.97	26.81	1477
400	5.03	34.04	26.93	1476
500	4.73	34.13	27.04	1477
600	4.40	34.19	27.13	1477
700	3.85	34.26	27.24	1477
800	3.28	34.53	27.51	1476

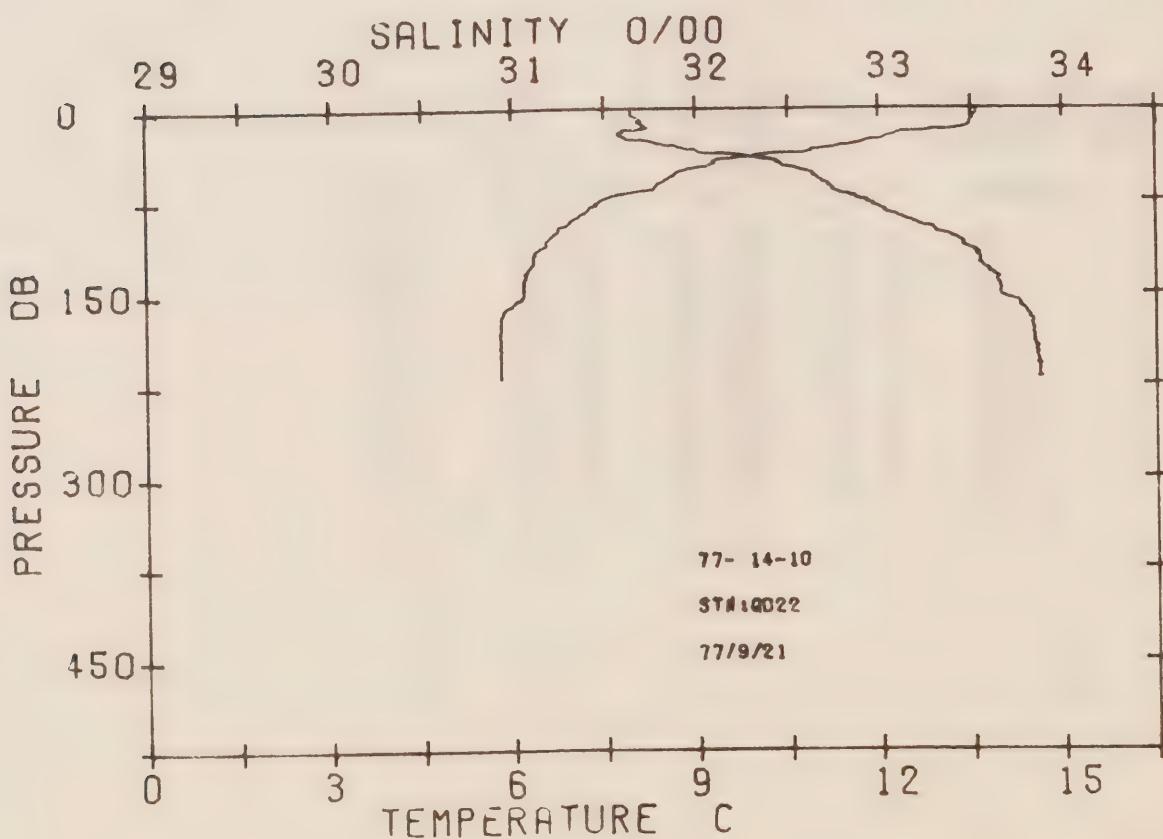
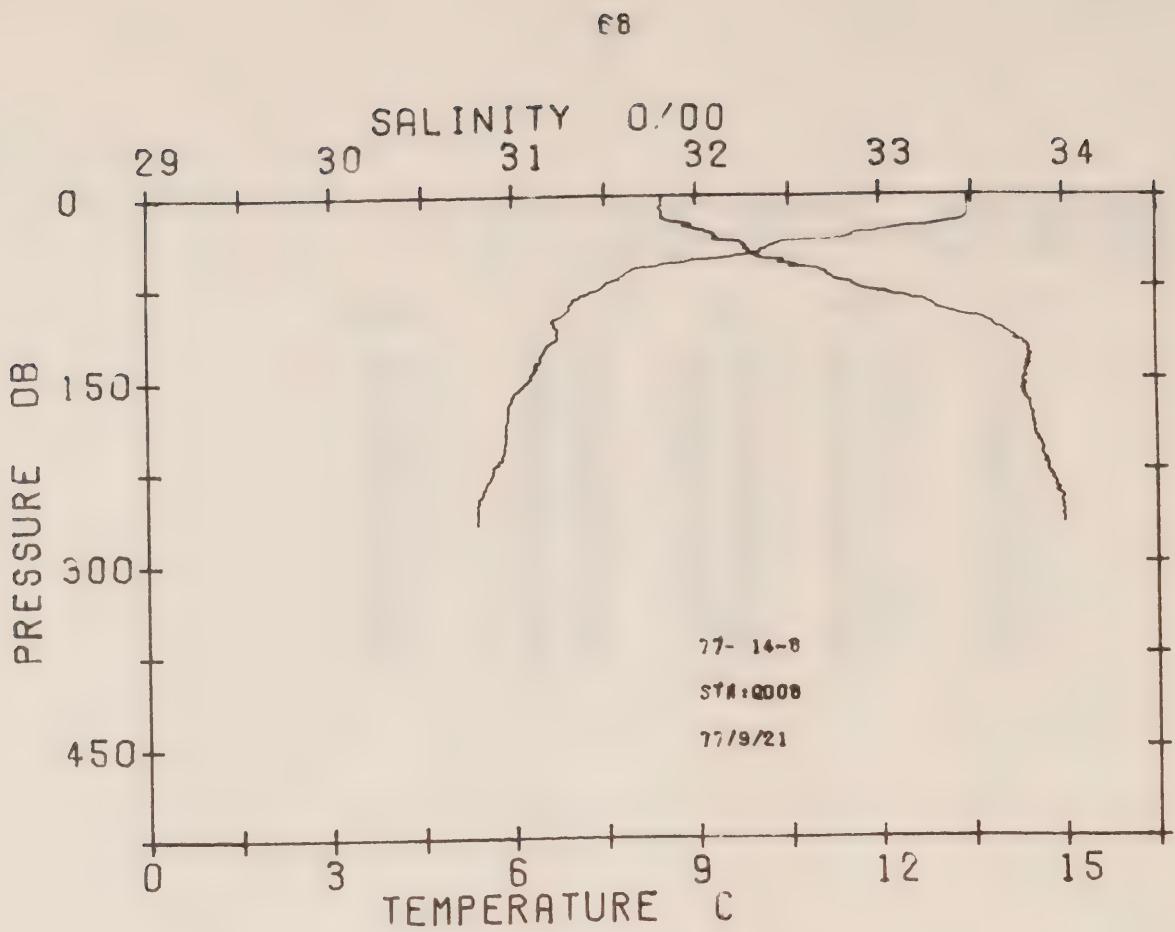


STATION QD08 CRUISE 77-14 CONS # 8
 POSITION 51-44.5N 130-47.0W
 DATE 77/ 9/21 TIME 5: 4:31 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13.43	31.82	23.87	1498.
10	13.44	31.80	23.85	1499.
20	13.41	31.81	23.87	1499.
30	11.90	32.05	24.34	1494.
50	9.62	32.35	24.97	1486.
75	7.48	32.87	25.70	1479.
100	6.73	33.54	26.33	1478.
125	6.53	33.81	26.57	1478.
150	6.26	33.79	26.59	1477.
175	5.90	33.82	26.66	1476.
200	5.87	33.86	26.69	1476.
225	5.65	33.91	26.76	1476.
250	5.42	33.99	26.85	1475.

STATION QD22 CRUISE 77-14 CONS # 10
 POSITION 51-56. ON 129-31.5W
 DATE 77/ 9/21 TIME 13: 6:56 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13.60	31.65	23.71	1499.
10	13.51	31.71	23.77	1499.
20	12.37	31.59	23.90	1495.
30	11.53	31.84	24.25	1492.
50	8.86	32.56	25.25	1484.
75	7.43	32.95	25.77	1479.
100	6.73	33.31	26.15	1477.
125	6.34	33.56	26.40	1477.
150	6.19	33.66	26.49	1477.
175	5.79	33.84	26.69	1476.
200	5.80	33.86	26.71	1476.



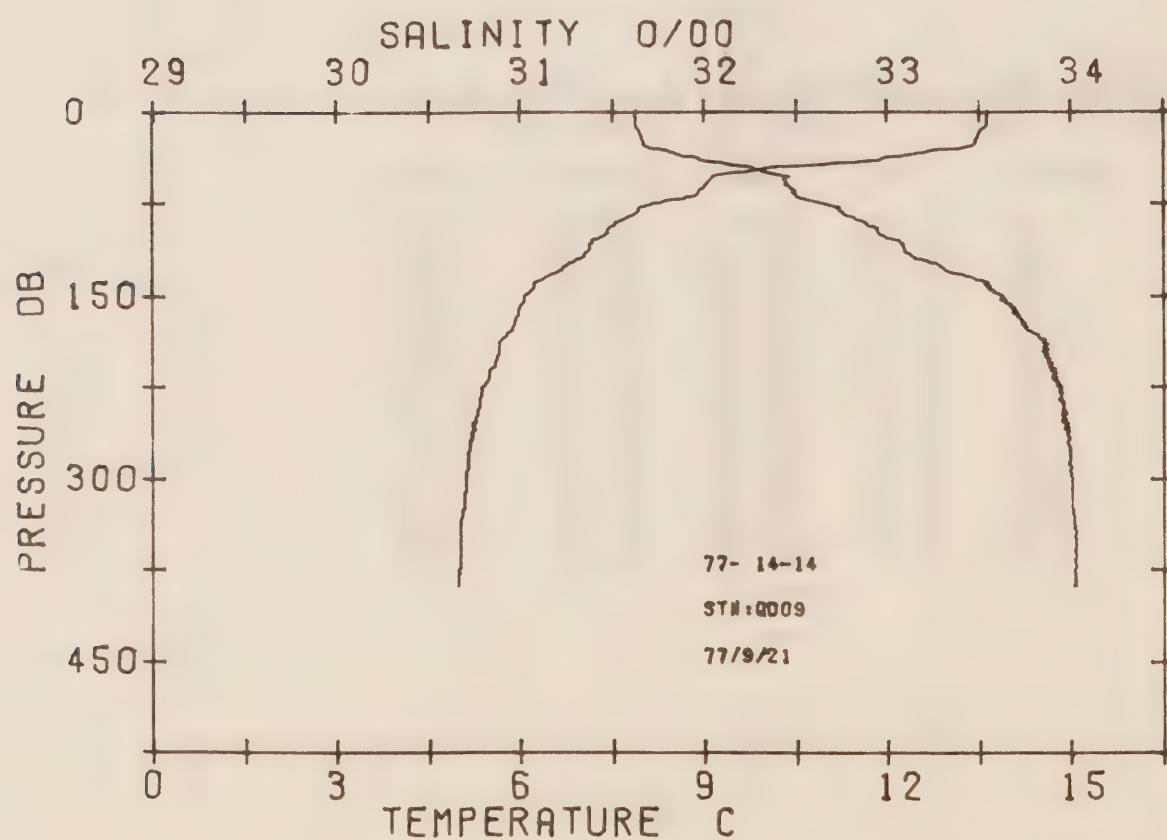
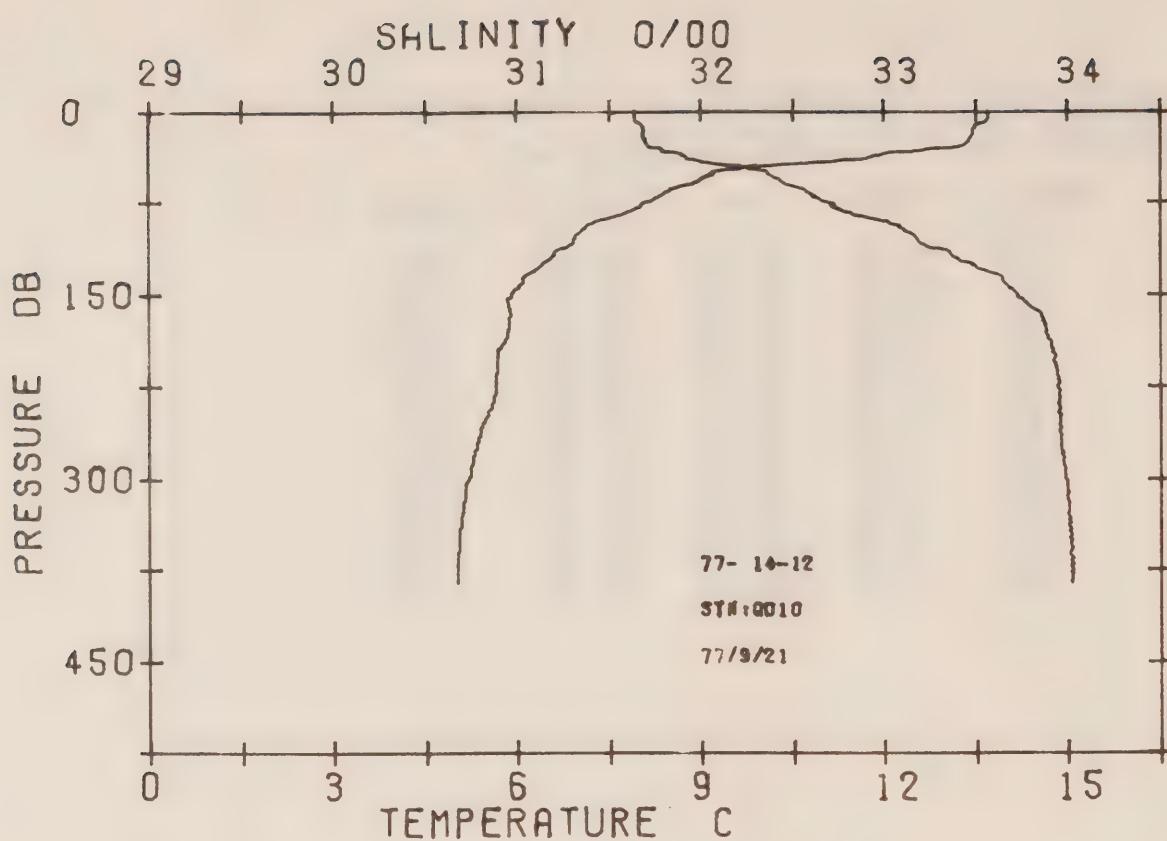
STATION QD10 CRUISE 77-14 CONS # 12
 POSITION 52-16.5N 130-16.0W
 DATE 77/ 9/21 TIME 18:43:26 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13.69	31.64	23.68	1499.
10	13.55	31.67	23.73	1499.
20	13.43	31.68	23.77	1499.
30	13.11	31.72	23.86	1498.
50	9.21	32.37	25.05	1485.
75	8.08	32.69	25.47	1481.
100	6.99	33.14	25.98	1478.
125	6.39	33.49	26.33	1477.
150	5.91	33.72	26.58	1475.
175	5.86	33.87	26.71	1476.
200	5.67	33.93	26.77	1476.
225	5.65	33.95	26.79	1476.
250	5.50	33.96	26.82	1476.
275	5.32	33.97	26.85	1475.
300	5.21	33.98	26.87	1475.

STATION QD09 CRUISE 77-14 CONS # 14
 POSITION 52- 4. ON 130-31.0W
 DATE 77/ 9/21 TIME 21: 7:58 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	13.62	31.63	23.68	1499.
10	13.63	31.63	23.69	1499.
20	13.47	31.66	23.74	1499.
30	13.15	31.71	23.84	1498.
50	9.51	32.35	24.99	1486.
75	8.15	32.65	25.43	1482.
100	7.40	32.96	25.78	1480.
125	6.74	33.29	26.13	1478.
150	6.07	33.63	26.49	1476.
175	5.88	33.77	26.62	1476.
200	5.63	33.86	26.72	1475.
225	5.36	33.96	26.83	1475.
250	5.28	33.96	26.84	1475.
275	5.17	34.00	26.89	1475.
300	5.11	34.00	26.90	1475.

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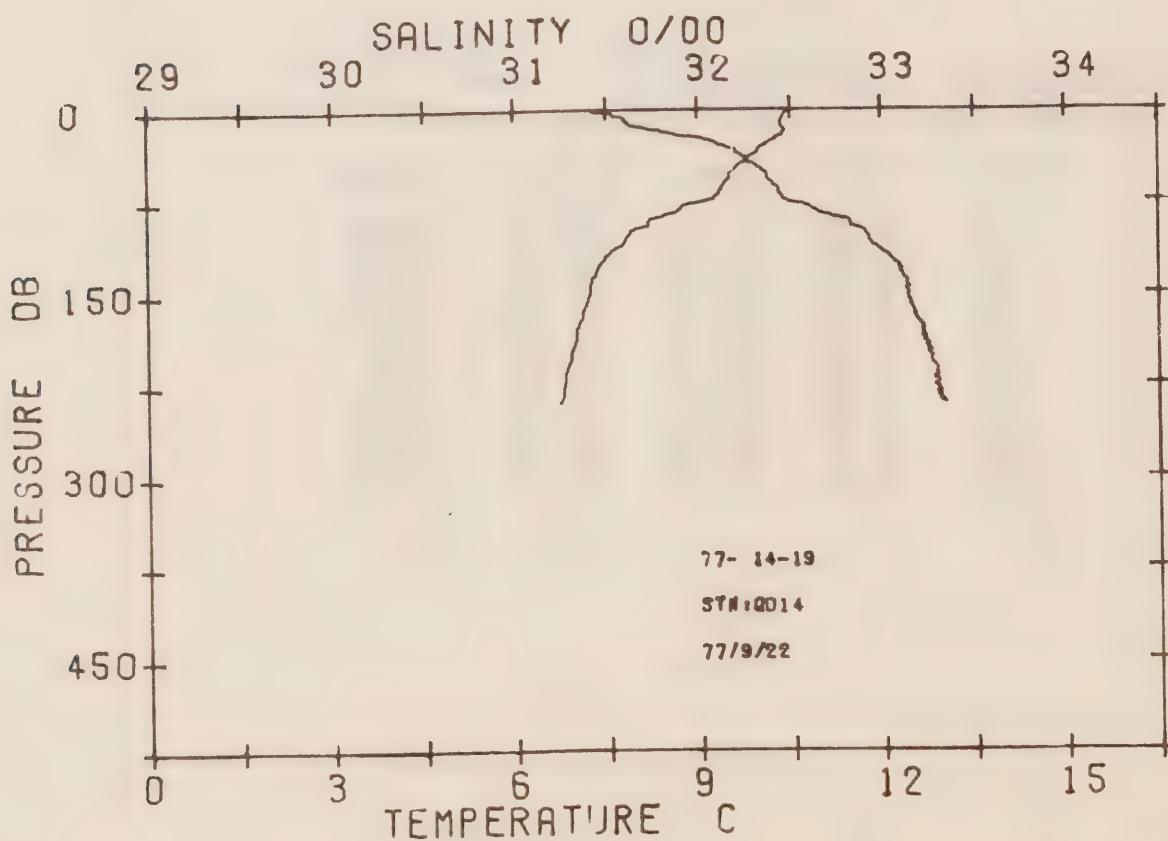
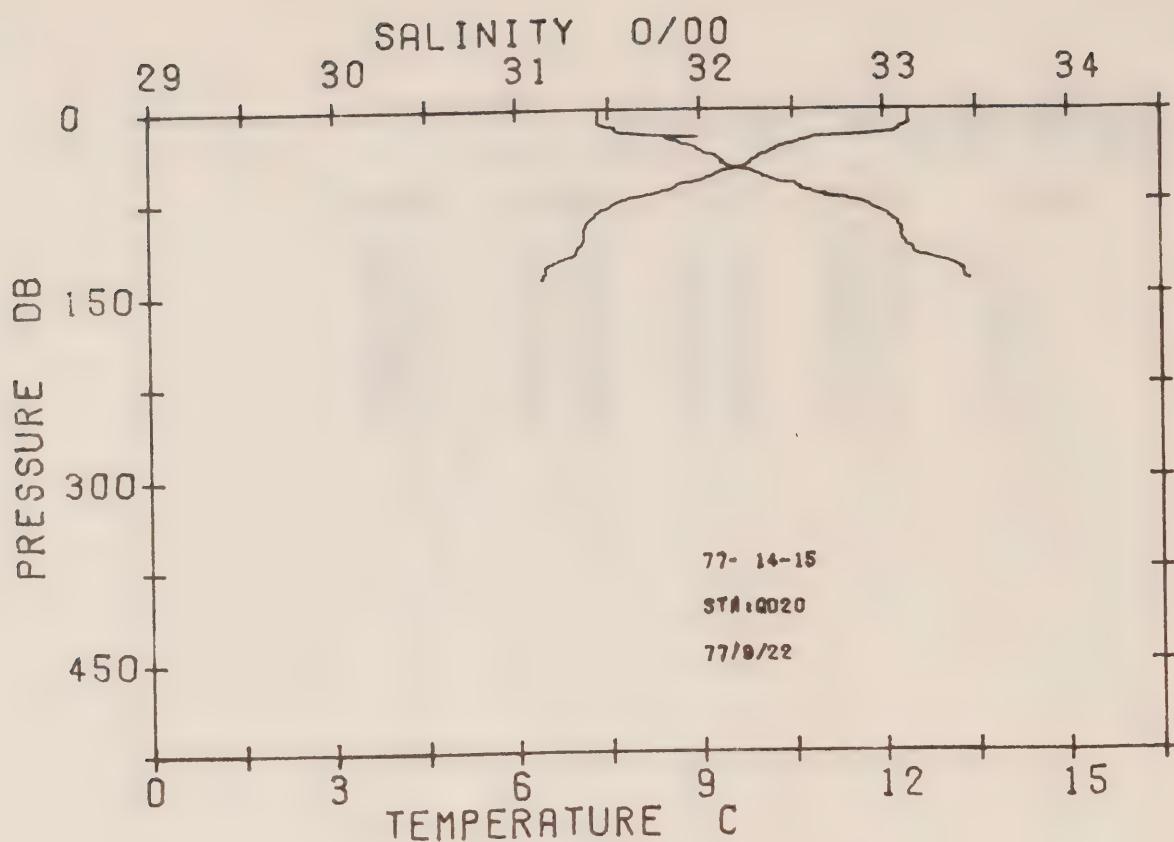


STATION QD20 CRUISE 77-14 CONS # 15
 POSITION 52-36.5N 130-33.5W
 DATE 77/ 9/22 TIME 1:14:17 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12.42	31.45	23.78	1495.
10	12.42	31.44	23.78	1495.
20	12.18	31.56	23.91	1494.
30	10.32	31.97	24.56	1488.
50	9.42	32.28	24.95	1486.
75	7.71	32.85	25.65	1480.
100	7.11	33.10	25.93	1479.
125	6.60	33.37	26.21	1477.

STATION QD14 CRUISE 77-14 CONS # 19
 POSITION 52-54. ON 129- 5W
 DATE 77/ 9/22 TIME 14:56:28 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	10.50	31.42	24.10	1488.
10	10.36	31.60	24.27	1488.
20	10.40	31.82	24.43	1488.
30	10.11	32.12	24.71	1488.
50	9.59	32.35	24.98	1486.
75	9.19	32.48	25.14	1485.
100	7.90	32.91	25.67	1481.
125	7.41	33.07	25.87	1480.
150	7.22	33.15	25.95	1480.
175	7.04	33.22	26.03	1480.
200	6.91	33.25	26.08	1480.
225	6.80	33.31	26.14	1480.



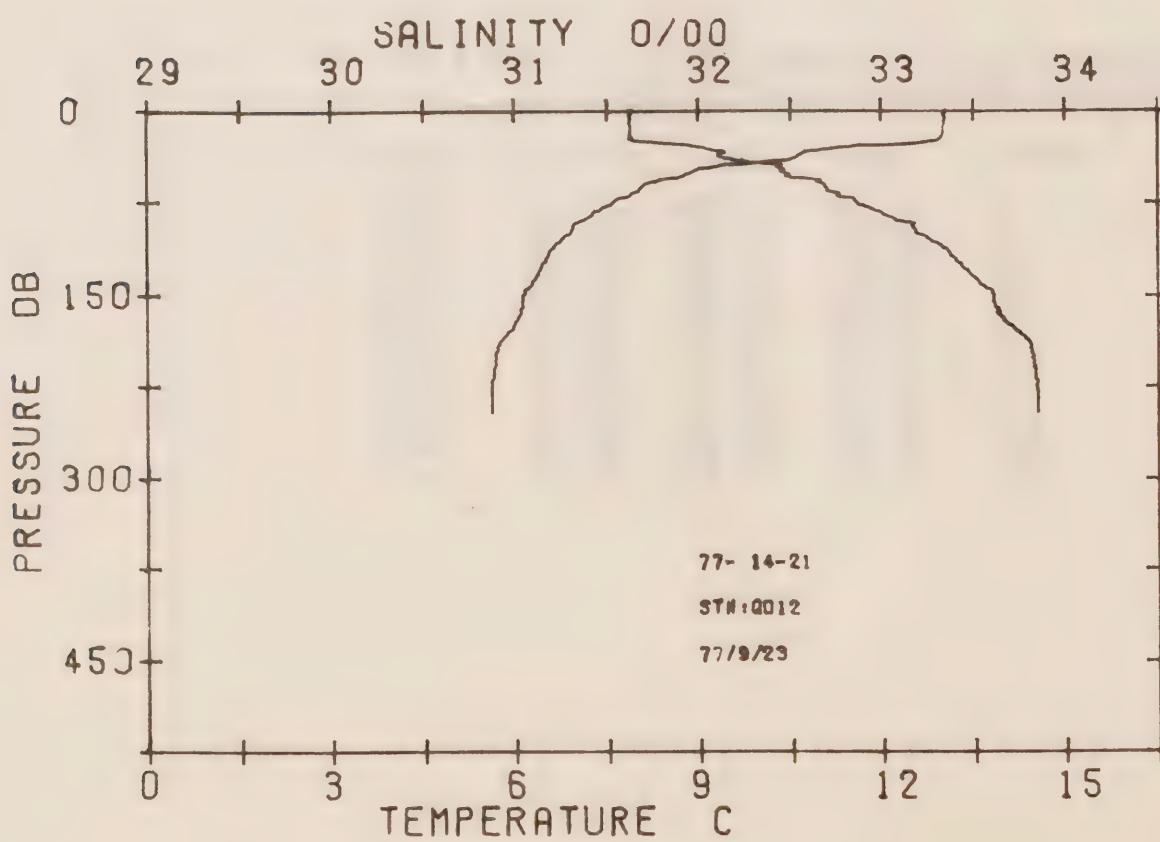
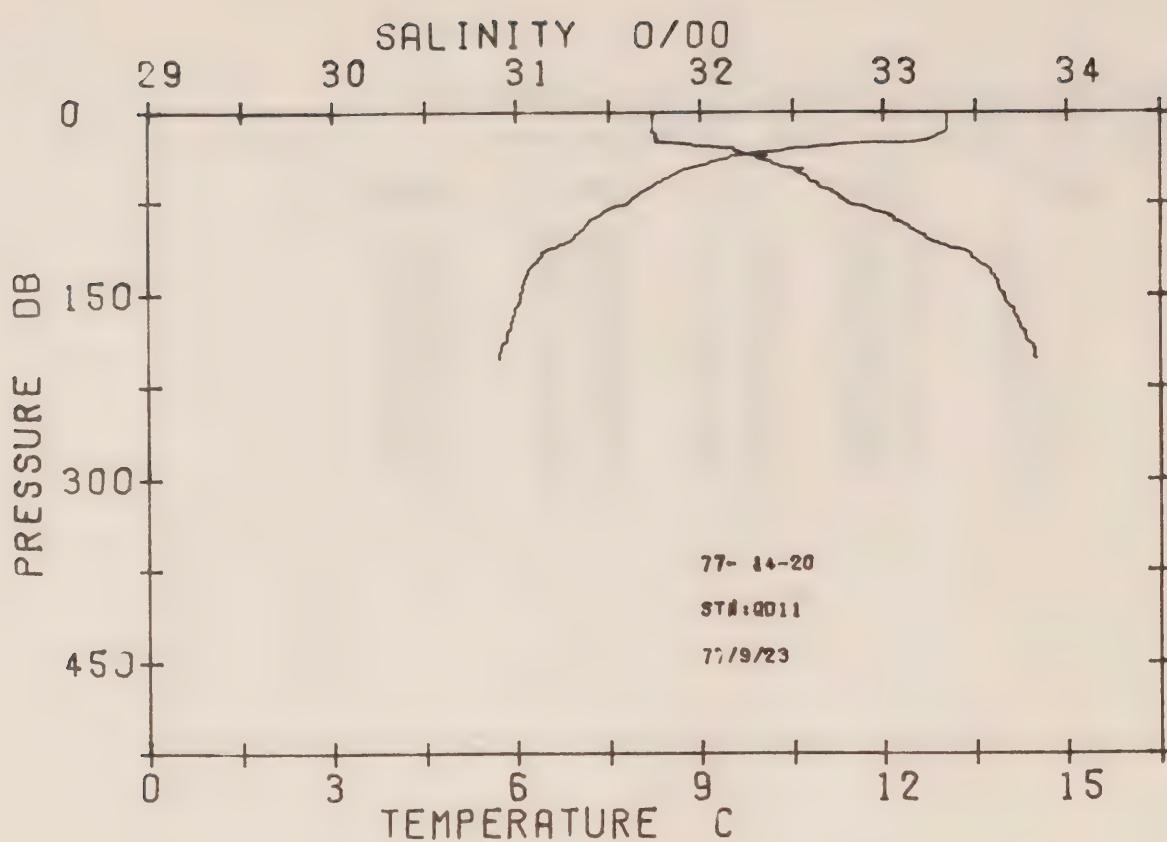
STATION QD11 CRUISE 77-14 CONS # 20
 POSITION 52-20. ON 129-40. OW
 DATE 77/ 9/23 TIME 17:50:24 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	13. 03	31. 74	23. 89	1497.
10	13. 03	31. 74	23. 89	1497.
20	12. 88	31. 77	23. 94	1497.
30	10. 75	32. 13	24. 61	1490.
50	8. 65	32. 51	25. 25	1483.
75	7. 81	32. 80	25. 60	1481.
100	7. 00	33. 20	26. 03	1478.
125	6. 28	33. 54	26. 39	1476.
150	6. 06	33. 66	26. 51	1476.
175	5. 90	33. 75	26. 60	1476.
200	5. 72	33. 82	26. 68	1476.

STATION QD12 CRUISE 77-14 CONS # 21
 POSITION 52-34. ON 129-53. 5W
 DATE 77/ 9/23 TIME 19:51:13 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	13. 04	31. 64	23. 81	1497.
10	13. 02	31. 63	23. 81	1497.
20	13. 00	31. 63	23. 81	1497.
30	11. 47	32. 00	24. 38	1492.
50	8. 93	32. 46	25. 16	1484.
75	7. 59	32. 87	25. 68	1480.
100	6. 90	33. 19	26. 03	1478.
125	6. 45	33. 44	26. 29	1477.
150	6. 14	33. 61	26. 46	1476.
175	5. 96	33. 71	26. 56	1476.
200	5. 67	33. 83	26. 70	1475.
225	5. 62	33. 84	26. 71	1476.

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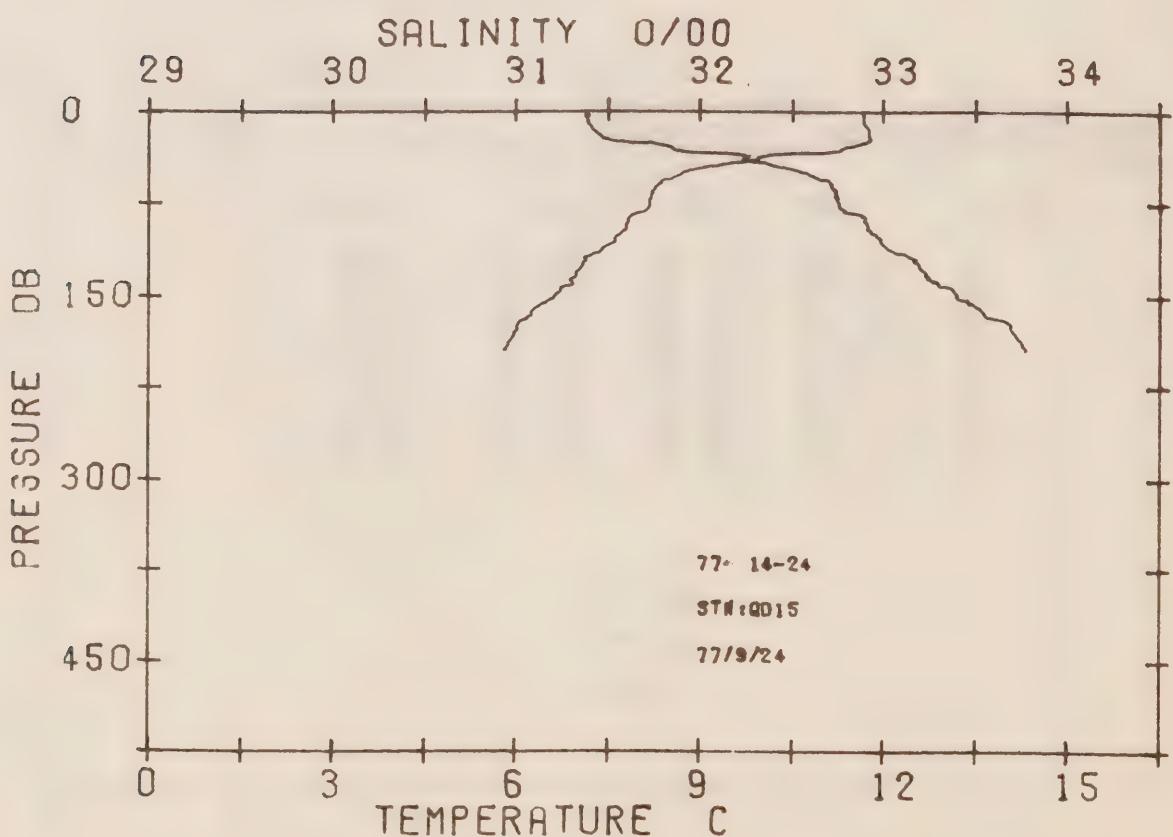
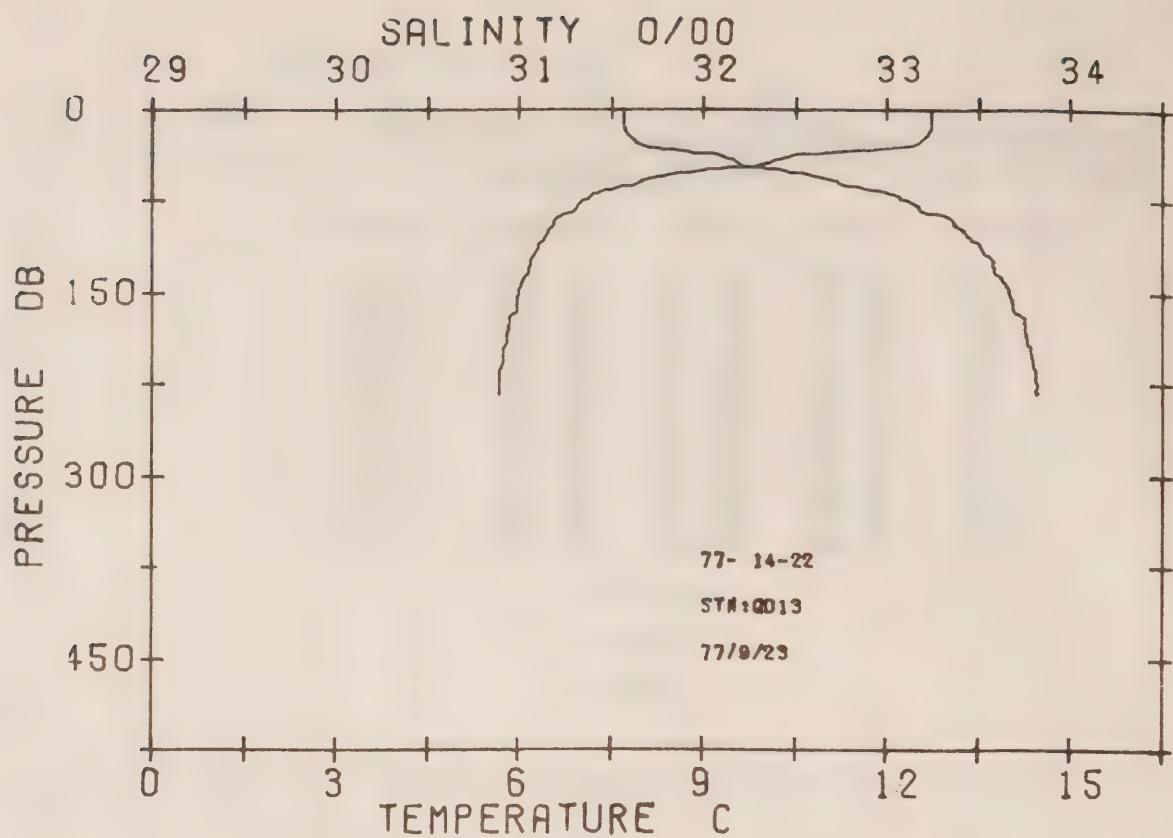


STATION QD13 CRUISE 77-14 CONS # 22
 POSITION 52-53. 5N 129-55. 9W
 DATE 77/ 9/23 TIME 22: 9:30 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 73	31. 56	23. 81	1496.
10	12. 73	31. 57	23. 82	1496.
20	12. 69	31. 58	23. 83	1496.
30	12. 41	31. 66	23. 94	1495.
50	9. 04	32. 42	25. 11	1484.
75	7. 04	33. 11	25. 95	1478.
100	6. 46	33. 43	26. 28	1476.
125	6. 18	33. 58	26. 44	1476.
150	5. 99	33. 67	26. 53	1476.
175	5. 82	33. 75	26. 61	1476.
200	5. 74	33. 79	26. 65	1476.
225	5. 68	33. 82	26. 68	1476.

STATION QD15 CRUISE 77-14 CONS # 24
 POSITION 53- 9. 5N 130-24. 0W
 DATE 77/ 9/24 TIME 1:20:37 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 68	31. 38	23. 87	1492.
10	11. 68	31. 39	23. 87	1492.
20	11. 78	31. 46	23. 91	1493.
30	11. 34	31. 85	24. 29	1492.
50	8. 71	32. 58	25. 29	1483.
75	8. 17	32. 76	25. 52	1482.
100	7. 68	32. 96	25. 75	1481.
125	7. 09	33. 20	26. 01	1479.
150	6. 64	33. 40	26. 23	1478.
175	6. 01	33. 69	26. 54	1476.



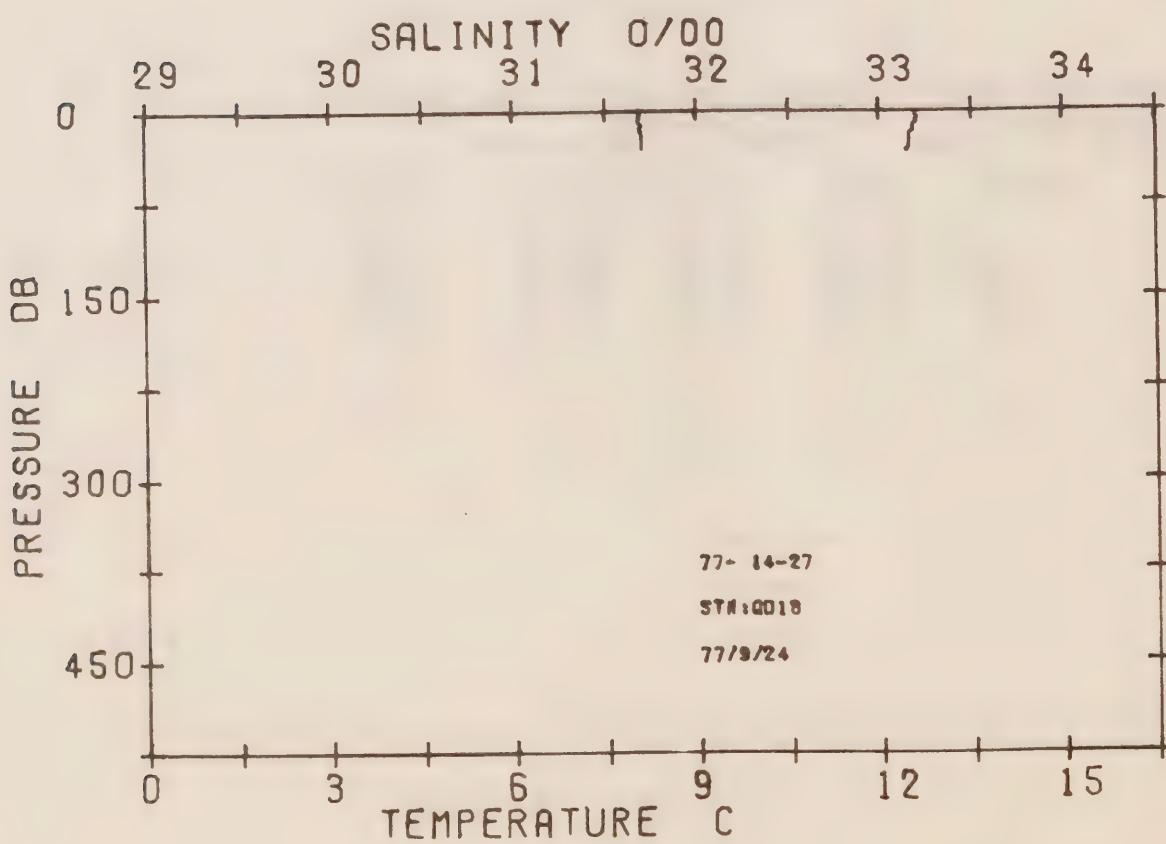
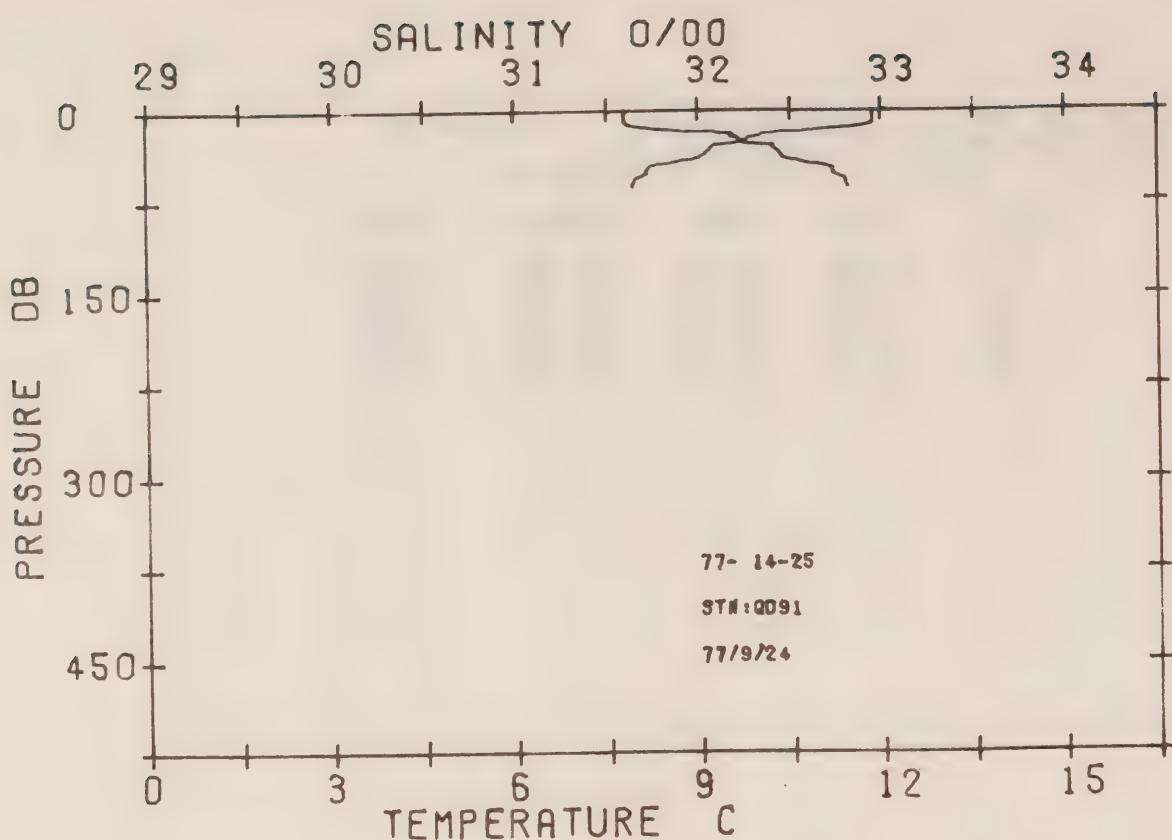
STATION QD91 CRUISE 77-14 CONS # 25
POSITION 52-54.5N 130-42.3W
DATE 77/ 9/24 TIME 8:17:22 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11.88	31.60	24.00	1493.
10	11.88	31.60	24.00	1493.
20	10.04	32.19	24.77	1487.
30	9.23	32.41	25.08	1485.
50	8.15	32.74	25.50	1481.

STATION QD18 CRUISE 77-14 CONS # 27
POSITION 53- . ON 131- . OW
DATE 77/ 9/24 TIME 10:38:56 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12.60	31.69	23.93	1495.
10	12.56	31.69	23.94	1495.
20	12.50	31.70	23.96	1495.
30	12.48	31.71	23.97	1495.

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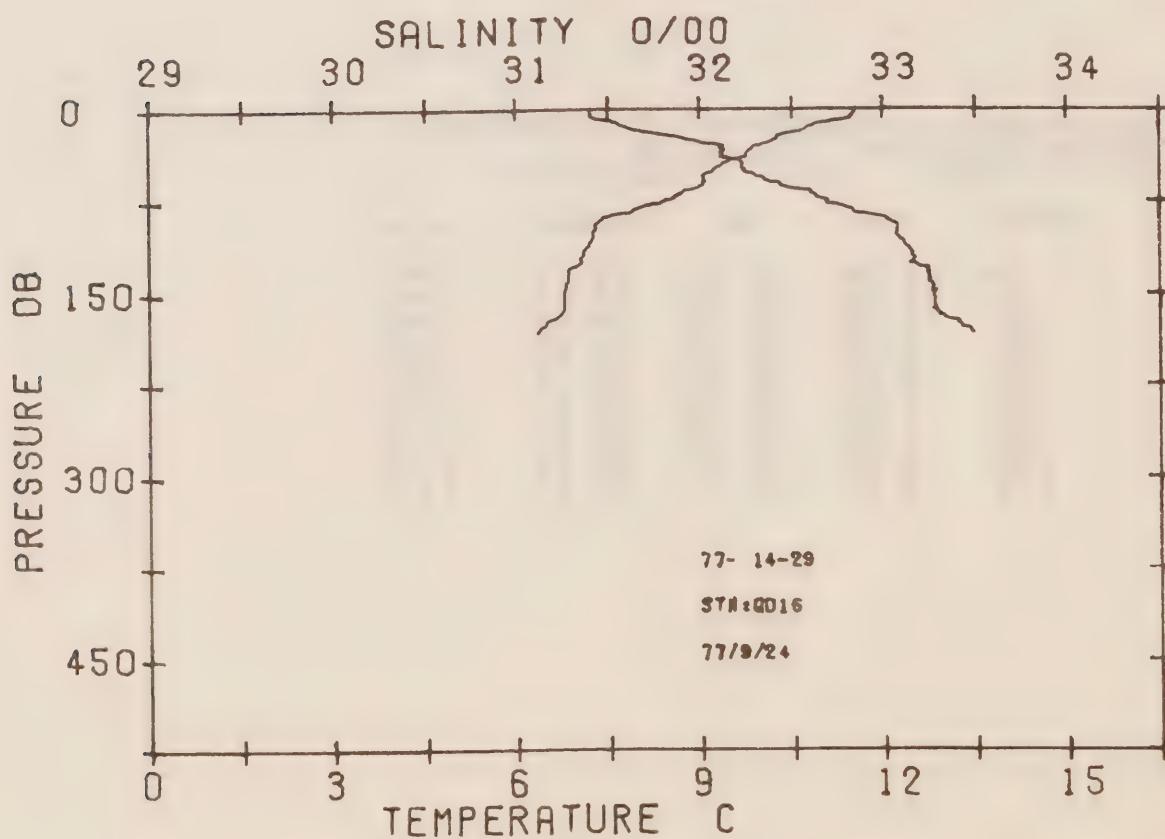
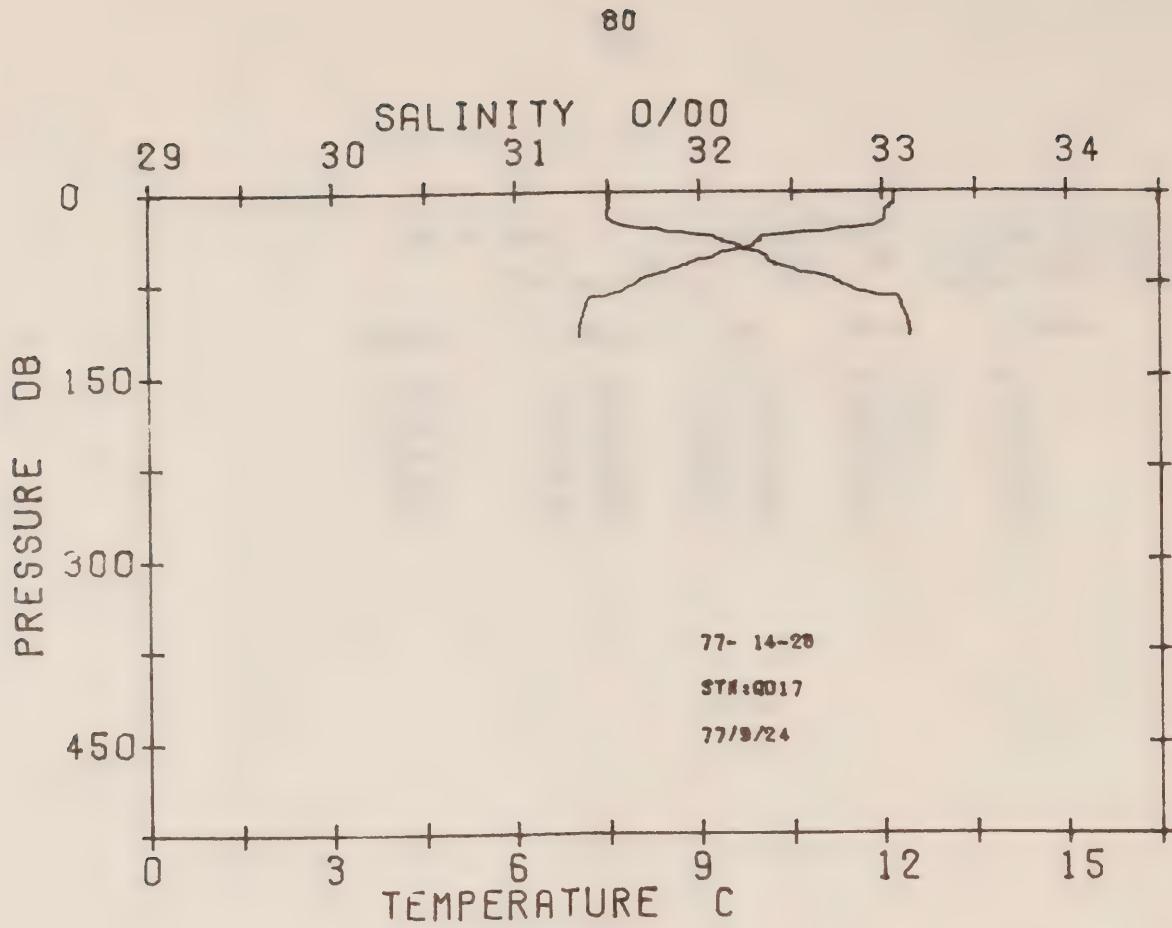


STATION QD17 CRUISE 77-14 CONS # 28
 POSITION 53-13.5N 130-45.0W
 DATE 77/ 9/24 TIME 12:19:48 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12.19	31.51	23.87	1494.
10	12.18	31.50	23.87	1494.
20	12.02	31.50	23.89	1493.
30	11.54	31.68	24.12	1492.
50	9.35	32.32	24.99	1485.
75	7.97	32.77	25.55	1481.
100	7.09	33.12	25.95	1479.

STATION QD16 CRUISE 77-14 CONS # 29
 POSITION 53-27.5N 130-45.0W
 DATE 77/ 9/24 TIME 13:42:27 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	11.56	31.40	23.91	1491.
10	11.16	31.52	24.07	1490.
20	10.53	31.72	24.33	1488.
30	9.95	32.13	24.75	1487.
50	9.21	32.25	24.96	1485.
75	8.42	32.70	25.43	1483.
100	7.27	33.08	25.89	1479.
125	7.07	33.17	25.99	1479.
150	6.79	33.27	26.11	1478.
175	6.51	33.41	26.26	1478.

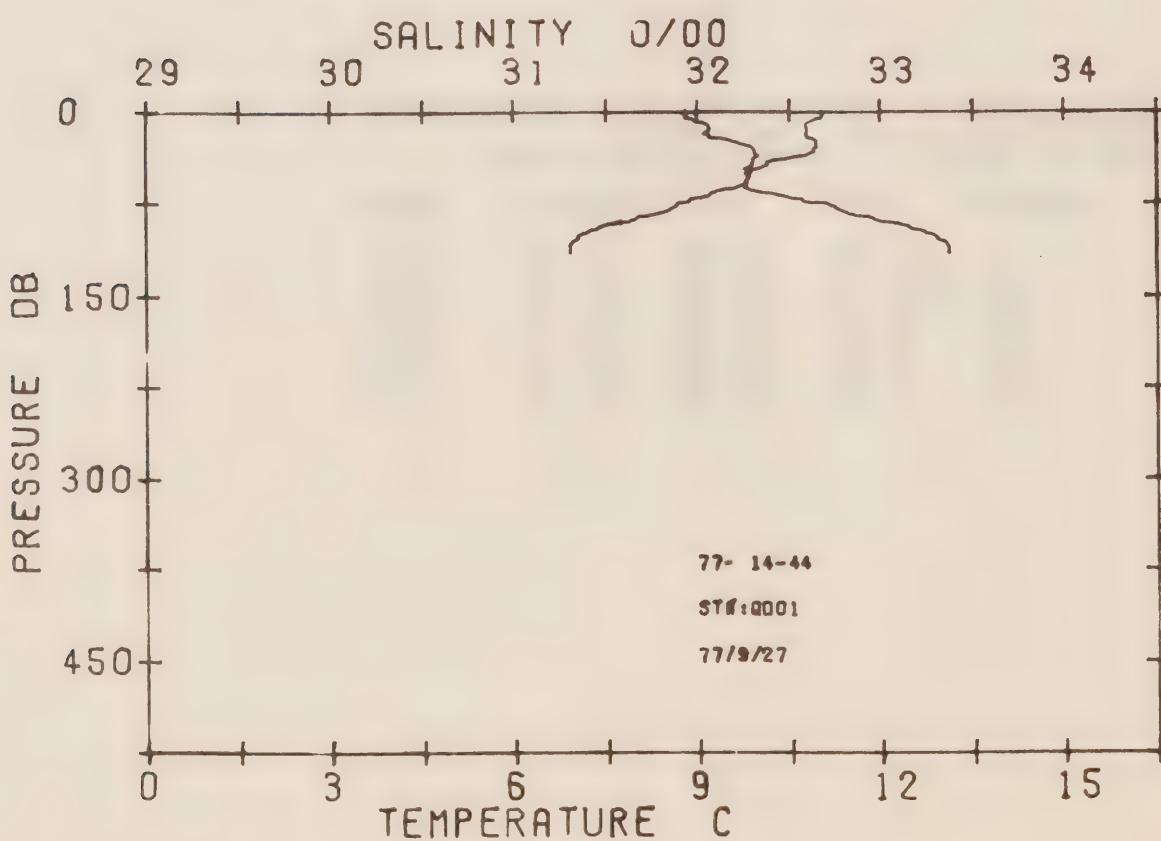
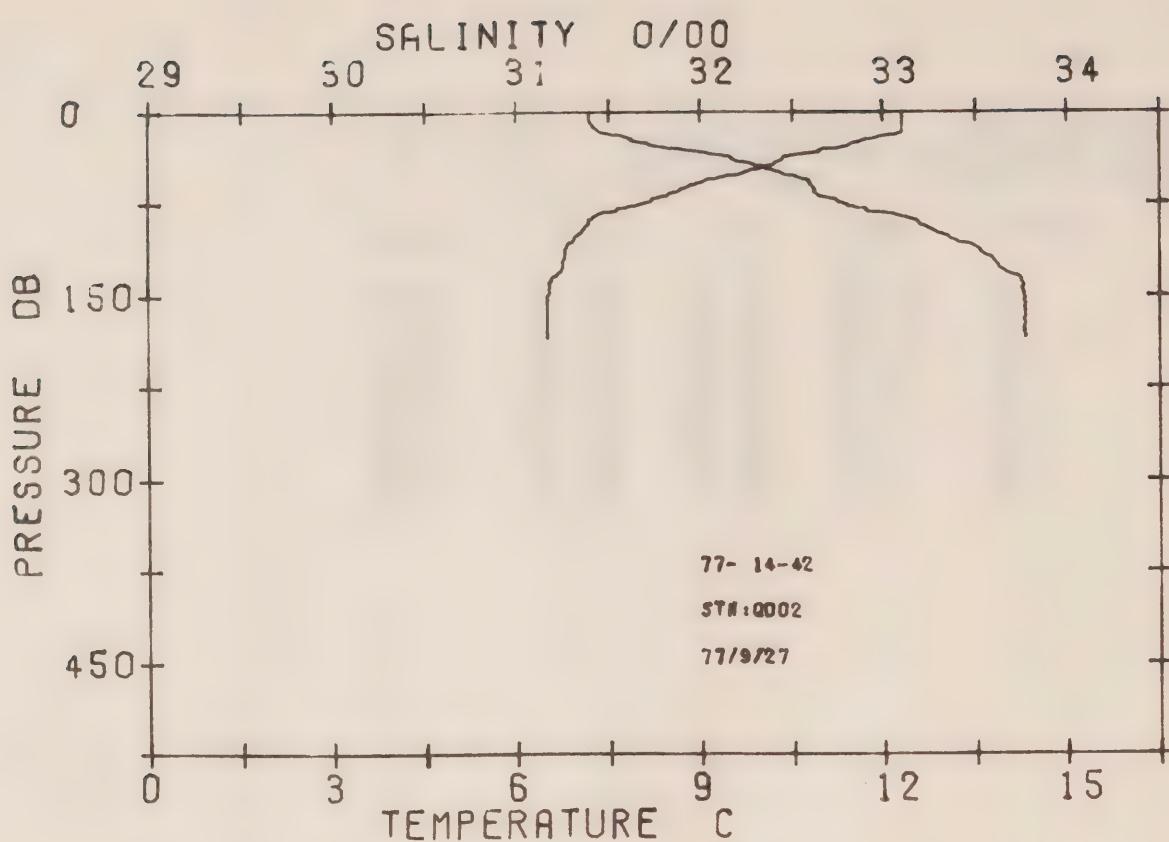


STATION QD02 CRUISE 77-14 CONS # 42
 POSITION 51-25. ON 128-35. OW
 DATE 77/ 9/27 TIME 4:59: 8 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 31	31. 39	23. 76	1494.
10	12. 30	31. 41	23. 77	1494.
20	12. 10	31. 57	23. 94	1494.
30	11. 19	31. 82	24. 30	1491.
50	9. 72	32. 44	25. 02	1487.
75	8. 10	32. 78	25. 54	1482.
100	7. 01	33. 33	26. 13	1479.
125	6. 75	33. 62	26. 39	1478.
150	6. 51	33. 77	26. 54	1478.
175	6. 49	33. 77	26. 55	1478.

STATION QD01 CRUISE 77-14 CONS # 44
 POSITION 51- 1. 2N 127-54. 5W
 DATE 77/ 9/27 TIME 8:35: 43 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	11. 04	31. 93	24. 41	1490.
10	10. 77	32. 04	24. 54	1490.
20	10. 77	32. 06	24. 56	1490.
30	10. 95	32. 30	24. 71	1491.
50	9. 86	32. 27	24. 87	1487.
75	8. 69	32. 70	25. 39	1484.
100	7. 09	33. 28	26. 08	1479.



APPENDIX B

Listings of physical properties, time-series stations: temperatures, salinity, sigma-t and sound speed.

Units are: depth -- metres; temperature -- degrees celsius; salinity -- parts per thousand; sigma-t -- no units; sound speed -- metres per second. The header for each cast in the time-series has the same format as Appendix A, as follows:

STATION ID	CRUISE NUMBER (year-number)	CONSECUTIVE NUMBER OF CTD CAST
POSITION (latitude and longitude: 00°00.0')		
DATE OF CAST (Year/month/day)	START TIME OF CAST (hour:minute:second) (Pacific Standard Time)	

STATION QD10 CRUISE 77-12 CONS #196
 POSITION 52-16. 5N 130-16. 0W
 DATE 77/ 5/22 TIME 2:42: 6 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9. 30	31. 68	24. 50	1484.
10	9. 31	31. 68	24. 50	1484.
20	8. 99	31. 69	24. 56	1483.
30	8. 37	32. 00	24. 89	1481.
50	8. 15	32. 26	25. 13	1481.
75	7. 27	32. 72	25. 61	1478.
100	6. 73	33. 20	26. 06	1477.
125	6. 13	33. 68	26. 52	1476.
150	5. 77	33. 88	26. 72	1475.
175	5. 43	34. 02	26. 87	1474.
200	5. 14	34. 10	26. 97	1474.
225	4. 99	34. 14	27. 02	1474.
250	4. 88	34. 15	27. 04	1473.
275	4. 77	34. 17	27. 07	1473.
300	4. 66	34. 20	27. 10	1473.

STATION QD10 CRUISE 77-12 CONS #197
 POSITION 52-16. 5N 130-16. 0W
 DATE 77/ 5/22 TIME 3:31: 52 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	9. 36	31. 44	24. 30	1483.
10	9. 36	31. 56	24. 40	1484.
20	8. 88	31. 68	24. 56	1482.
30	8. 35	31. 97	24. 87	1481.
50	8. 24	32. 24	25. 10	1481.
75	7. 29	32. 69	25. 59	1478.
100	6. 75	33. 16	26. 03	1477.
125	6. 16	33. 65	26. 49	1476.
150	5. 73	33. 89	26. 73	1475.
175	5. 42	34. 00	26. 86	1474.
200	5. 15	34. 08	26. 95	1474.
225	4. 97	34. 12	27. 00	1473.
250	4. 83	34. 16	27. 05	1473.
275	4. 70	34. 18	27. 09	1473.
300	4. 63	34. 21	27. 11	1473.

STATION QD10 CRUISE 77-12 CONS #198
 POSITION 52-16.5N 130-16.0W
 DATE 77/ 5/22 TIME 4:31:48 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.29	31.70	24.52	1484.
10	9.23	31.68	24.51	1483.
20	8.84	31.79	24.65	1482.
30	8.32	32.02	24.91	1481.
50	7.96	32.26	25.16	1480.
75	7.14	32.82	25.71	1478.
100	6.56	33.36	26.21	1477.
125	6.20	33.65	26.48	1476.
150	6.05	33.74	26.58	1476.
175	5.53	33.98	26.83	1475.
200	5.22	34.08	26.94	1474.
225	5.10	34.11	26.98	1474.
250	4.93	34.15	27.04	1474.
275	4.79	34.18	27.08	1474.
300	4.73	34.19	27.09	1474.

STATION QD10 CRUISE 77-12 CONS #199
 POSITION 52-16.5N 130-16.0W
 DATE 77/ 5/22 TIME 5:34:47 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.29	31.69	24.51	1484.
10	9.28	31.68	24.50	1484.
20	8.89	31.75	24.62	1482.
30	8.37	31.99	24.88	1481.
50	8.12	32.31	25.17	1481.
75	7.12	32.85	25.73	1478.
100	6.56	33.35	26.21	1477.
125	6.23	33.62	26.46	1476.
150	6.06	33.74	26.57	1476.
175	5.63	33.94	26.79	1475.
200	5.34	34.04	26.90	1474.
225	5.20	34.08	26.95	1474.
250	4.99	34.13	27.01	1474.
275	4.91	34.15	27.04	1474.
300	4.74	34.20	27.09	1474.

STATION QD10 CRUISE 77-12 CONS #200
POSITION 52-16.5N 130-16.0W
DATE 77/ 5/22 TIME 6:28: 3 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	9.23	31.69	24.52	1483.
10	8.95	31.74	24.60	1482.
20	8.61	31.92	24.79	1482.
30	8.29	32.04	24.94	1481.
50	7.74	32.37	25.28	1479.
75	7.09	32.87	25.75	1478.
100	6.56	33.37	26.22	1477.
125	6.22	33.63	26.47	1476.
150	6.01	33.78	26.61	1476.
175	5.58	33.97	26.82	1475.
200	5.24	34.08	26.94	1474.
225	5.12	34.10	26.97	1474.
250	5.02	34.12	27.00	1474.
275	4.91	34.15	27.03	1474.
300	4.81	34.17	27.06	1474.

STATION QD30 CRUISE 77-13 CONS # 43
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 0: 9:59 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 67	31. 73	23. 95	1496.
10	11. 95	31. 73	24. 09	1493.
20	11. 46	31. 72	24. 17	1492.
30	10. 36	31. 85	24. 46	1488.
50	9. 42	32. 03	24. 75	1485.
75	8. 56	32. 24	25. 05	1483.
100	6. 91	33. 10	25. 96	1478.
125	6. 28	33. 57	26. 41	1476.
150	5. 91	33. 77	26. 62	1476.
175	5. 67	33. 94	26. 78	1475.
200	5. 54	33. 95	26. 80	1475.

STATION QD30 CRUISE 77-13 CONS # 45
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 1:18:14 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 24	31. 72	24. 02	1494.
10	12. 11	31. 70	24. 03	1494.
20	11. 17	31. 76	24. 25	1491.
30	10. 48	31. 82	24. 42	1489.
50	9. 83	31. 98	24. 65	1487.
75	8. 88	32. 15	24. 93	1484.
100	6. 94	33. 08	25. 94	1478.
125	6. 19	33. 66	26. 49	1476.
150	5. 85	33. 85	26. 68	1475.
175	5. 53	33. 96	26. 82	1475.

STATION QD30 CRUISE 77-13 CONS # 46
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 2:10:25 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 16	26. 40	19. 93	1487.
10	12. 06	31. 67	24. 02	1494.
20	10. 86	31. 77	24. 31	1490.
30	10. 35	31. 85	24. 46	1488.
50	9. 75	31. 97	24. 65	1486.
75	8. 85	32. 16	24. 95	1484.
100	6. 95	33. 07	25. 93	1478.
125	6. 12	33. 70	26. 54	1476.
150	5. 90	33. 88	26. 71	1476.
175	5. 54	33. 94	26. 80	1475.

STATION QD30 CRUISE 77-13 CONS # 47
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 3: 5:12 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 14	31. 70	24. 03	1494.
10	12. 07	31. 72	24. 06	1494.
20	11. 17	31. 74	24. 24	1491.
30	10. 54	31. 82	24. 40	1489.
50	9. 93	31. 94	24. 60	1487.
75	9. 08	32. 09	24. 85	1484.
100	7. 07	32. 99	25. 85	1478.
125	6. 13	33. 76	26. 58	1476.
150	5. 88	33. 90	26. 72	1476.
175	5. 75	33. 92	26. 76	1476.

STATION QD30 CRUISE 77-13 CONS # 49
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 4:20:58 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.22	31.70	24.01	1494.
10	12.23	31.69	24.01	1494.
20	11.73	31.69	24.10	1493.
30	10.46	31.83	24.43	1488.
50	9.79	31.97	24.65	1487.
75	8.54	32.24	25.06	1483.
100	6.95	33.07	25.93	1478.
125	6.26	33.61	26.44	1476.
150	5.87	33.87	26.70	1476.
175	5.56	33.95	26.80	1475.

STATION QD30 CRUISE 77-13 CONS # 50
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 5: 4:38 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.33	31.74	24.02	1495.
10	12.24	31.69	24.00	1494.
20	11.24	31.73	24.21	1491.
30	10.36	31.85	24.46	1488.
50	9.99	31.92	24.57	1487.
75	8.80	32.16	24.95	1483.
100	7.06	32.98	25.85	1478.
125	6.52	33.40	26.25	1477.
150	6.04	33.71	26.56	1476.
175	5.95	33.88	26.70	1476.

STATION QD30 CRUISE 77-13 CONS # 52
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 6: 15: 24 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 24	31. 70	24. 01	1494.
10	12. 22	31. 70	24. 02	1494.
20	11. 43	31. 73	24. 18	1492.
30	10. 87	31. 74	24. 28	1490.
50	9. 75	31. 96	24. 65	1486.
75	8. 40	32. 28	25. 11	1482.
100	7. 59	32. 67	25. 53	1480.
125	6. 70	33. 27	26. 12	1478.
150	6. 06	33. 71	26. 55	1476.
175	5. 84	33. 91	26. 73	1476.

STATION QD30 CRUISE 77-13 CONS # 53
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 7: 1: 55 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 15	31. 69	24. 02	1494.
10	12. 12	31. 69	24. 03	1494.
20	11. 60	31. 70	24. 13	1492.
30	10. 60	31. 79	24. 37	1489.
50	9. 31	32. 05	24. 79	1485.
75	8. 31	32. 33	25. 16	1482.
100	7. 68	32. 62	25. 48	1480.
125	7. 02	33. 02	25. 89	1479.
150	6. 23	33. 60	26. 44	1477.
175	5. 82	33. 88	26. 72	1476.

STATION QD30 CRUISE 77-13 CONS # 55
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 8: 7: 0 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 23	31. 68	23. 99	1494.
10	12. 21	31. 70	24. 01	1494.
20	11. 94	31. 70	24. 07	1493.
30	10. 90	31. 71	24. 26	1490.
50	9. 23	32. 05	24. 80	1485.
75	8. 24	32. 38	25. 21	1482.
100	7. 55	32. 68	25. 54	1480.
125	7. 02	33. 02	25. 89	1479.
150	6. 44	33. 46	26. 30	1477.
175	6. 00	33. 85	26. 66	1476.

STATION QD30 CRUISE 77-13 CONS # 56
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 9: 4: 5 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 41	31. 66	23. 95	1495.
10	12. 29	31. 66	23. 97	1494.
20	12. 19	31. 66	23. 99	1494.
30	10. 79	31. 74	24. 31	1490.
50	9. 50	32. 02	24. 73	1486.
75	8. 16	32. 40	25. 24	1481.
100	7. 34	32. 82	25. 68	1479.
125	6. 53	33. 39	26. 24	1477.
150	6. 12	33. 68	26. 52	1476.
175	5. 79	33. 89	26. 73	1476.

STATION QD30 CRUISE 77-13 CONS # 57
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 10: 1:18 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 65	31. 68	23. 92	1496.
10	12. 20	31. 66	23. 99	1494.
20	10. 97	31. 70	24. 24	1490.
30	10. 24	31. 89	24. 51	1488.
50	8. 95	32. 15	24. 92	1484.
75	7. 92	32. 51	25. 36	1481.
100	7. 13	32. 98	25. 84	1479.
125	6. 34	33. 53	26. 37	1477.
150	6. 12	33. 69	26. 53	1476.
175	5. 65	33. 93	26. 77	1475.

STATION QD30 CRUISE 77-13 CONS # 58
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 11: 2:32 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 63	31. 71	23. 94	1496.
10	11. 61	31. 66	24. 09	1492.
20	10. 48	31. 82	24. 42	1488.
30	9. 80	31. 98	24. 65	1486.
50	8. 60	32. 22	25. 03	1482.
75	7. 73	32. 60	25. 45	1480.
100	6. 83	33. 18	26. 03	1478.
125	6. 26	33. 61	26. 45	1476.
150	6. 11	33. 77	26. 59	1476.
175	5. 64	33. 94	26. 78	1475.

STATION QD30 CRUISE 77-13 CONS # 60
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 12: 3:59 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.84	31.66	23.87	1496.
10	11.87	31.70	24.08	1493.
20	11.09	31.72	24.24	1490.
30	10.36	31.84	24.45	1488.
50	9.32	32.05	24.79	1485.
75	8.38	32.31	25.14	1482.
100	7.69	32.62	25.47	1480.
125	6.19	33.66	26.49	1476.
150	6.09	33.74	26.57	1476.
175	5.62	33.94	26.79	1475.

STATION QD30 CRUISE 77-13 CONS # 61
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 13: 7:35 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12.89	31.68	23.87	1496.
10	11.40	31.73	24.18	1491.
20	10.60	31.79	24.37	1489.
30	10.16	31.88	24.52	1487.
50	9.36	32.03	24.77	1485.
75	8.54	32.25	25.06	1483.
100	7.33	32.83	25.69	1479.
125	6.15	33.70	26.53	1476.
150	6.01	33.83	26.65	1476.
175	5.62	33.93	26.78	1475.

STATION QD30 CRUISE 77-13 CONS # 62
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 14: 3:35 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 97	31. 70	23. 87	1497.
10	12. 10	31. 70	24. 04	1494.
20	10. 84	31. 79	24. 33	1490.
30	10. 34	31. 90	24. 50	1488.
50	9. 67	31. 99	24. 69	1486.
75	8. 47	32. 27	25. 09	1482.
100	7. 17	32. 94	25. 80	1479.
125	6. 11	33. 69	26. 53	1476.
150	5. 95	33. 83	26. 66	1476.
175	5. 62	33. 94	26. 79	1475.
200	5. 59	33. 95	26. 80	1475.

STATION QD30 CRUISE 77-13 CONS # 63
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 15: 7:51 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 90	31. 70	23. 88	1496.
10	12. 11	31. 68	24. 02	1494.
20	10. 86	31. 77	24. 32	1490.
30	10. 43	31. 84	24. 44	1488.
50	9. 64	32. 02	24. 71	1486.
75	8. 56	32. 24	25. 05	1483.
100	7. 50	32. 72	25. 58	1480.
125	6. 05	33. 72	26. 56	1476.
150	5. 95	33. 89	26. 70	1476.
175	5. 71	33. 94	26. 77	1475.
200	5. 58	33. 95	26. 80	1475.

STATION QD30 CRUISE 77-13 CONS # 65
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 16: 1:37 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 47	31. 65	23. 93	1495.
10	11. 94	31. 69	24. 06	1493.
20	11. 16	31. 71	24. 21	1491.
30	10. 46	31. 84	24. 44	1489.
50	9. 24	32. 07	24. 81	1485.
75	8. 38	32. 31	25. 13	1482.
100	6. 97	33. 08	25. 93	1478.
125	6. 11	33. 68	26. 52	1476.
150	5. 97	33. 87	26. 69	1476.
175	5. 63	33. 95	26. 79	1475.

STATION QD30 CRUISE 77-13 CONS # 66
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 17: 0:16 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 74	31. 73	23. 94	1496.
10	12. 09	31. 71	24. 05	1494.
20	11. 66	31. 70	24. 12	1492.
30	10. 66	31. 84	24. 40	1489.
50	9. 57	31. 99	24. 70	1486.
75	8. 42	32. 29	25. 11	1482.
100	7. 53	32. 70	25. 56	1480.
125	6. 31	33. 56	26. 40	1476.
150	6. 01	33. 78	26. 61	1476.
175	5. 79	33. 92	26. 75	1476.

STATION QD30 CRUISE 77-13 CONS # 67
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 18: 0:22 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 74	31. 67	23. 89	1496.
10	12. 21	31. 67	23. 99	1494.
20	11. 68	31. 69	24. 11	1493.
30	11. 23	31. 76	24. 24	1491.
50	9. 78	31. 98	24. 66	1487.
75	8. 82	32. 15	24. 94	1484.
100	7. 94	32. 49	25. 34	1481.
125	6. 68	33. 28	26. 13	1478.
150	6. 11	33. 66	26. 51	1476.
175	5. 98	33. 87	26. 69	1476.

STATION QD30 CRUISE 77-13 CONS # 68
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 19: 1:51 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 73	31. 73	23. 94	1496.
10	12. 22	31. 71	24. 02	1494.
20	11. 57	31. 72	24. 15	1492.
30	10. 76	31. 84	24. 39	1490.
50	9. 81	31. 99	24. 66	1487.
75	8. 74	32. 19	24. 99	1483.
100	7. 61	32. 66	25. 52	1480.
125	6. 83	33. 20	26. 05	1478.
150	6. 38	33. 50	26. 35	1477.
175	5. 96	33. 85	26. 68	1476.

STATION QD30 CRUISE 77-13 CONS # 70
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 20: 2:57 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0	12. 77	31. 66	23. 88	1496.
10	12. 44	31. 64	23. 93	1495.
20	11. 52	31. 69	24. 13	1492.
30	10. 31	31. 87	24. 49	1488.
50	9. 84	31. 98	24. 64	1487.
75	8. 20	32. 38	25. 21	1482.
100	7. 42	32. 78	25. 64	1479.
125	6. 88	33. 15	26. 00	1478.
150	6. 03	33. 72	26. 56	1476.
175	5. 85	33. 91	26. 73	1476.

STATION QD30 CRUISE 77-13 CONS # 71
 POSITION 51-19. ON 128-50. OW
 DATE 77/ 7/20 TIME 21: 0:14 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	12. 94	31. 69	23. 87	1497.
10	12. 88	31. 67	23. 86	1496.
20	12. 33	31. 67	23. 97	1495.
30	10. 81	31. 83	24. 37	1490.
50	9. 82	31. 97	24. 64	1487.
75	8. 63	32. 21	25. 01	1483.
100	7. 29	32. 88	25. 74	1479.
125	6. 79	33. 21	26. 06	1478.
150	5. 94	33. 85	26. 68	1476.
175	5. 75	33. 93	26. 76	1476.

STATION QD30 CRUISE 77-13 CONS # 73
POSITION 51-19. ON 128-50. OW
DATE 77/ 7/20 TIME 22: 5: 2 PST

DEPTH	TEMP	SAL	SIGMA-T	SOUND
0*	13. 06	31. 68	23. 83	1497.
10	12. 79	31. 66	23. 88	1496.
20	11. 95	31. 71	24. 07	1493.
30	10. 49	31. 86	24. 45	1489.
50	9. 77	31. 99	24. 67	1487.
75	8. 01	32. 47	25. 31	1481.
100	6. 87	33. 15	26. 01	1478.
125	6. 44	33. 46	26. 31	1477.
150	6. 10	33. 68	26. 52	1476.
175	5. 68	33. 93	26. 77	1475.

APPENDIX C

Listings of dissolved oxygen data.

The dissolved oxygen content (mL/L) for the region are listed by cruise number for standard depths: values are rounded off to the nearest one hundredth mL/L.

Dissolved Oxygen Content (mL/L)

Station QD30 Time Series
Cruise 77-13 July 1977

Depth (m)	TIME (PST)					2142
	0041	0337	0730	1130	1530	
0	6.68	6.59	6.73	6.68	6.66	6.65
10	6.70	6.62	6.72	6.68	6.65	6.71
20	6.41	6.57	6.48	6.23	6.42	6.57
30	6.02	6.14	6.02	5.98	6.12	6.01
50	5.68	5.76	5.50	5.52	5.77	5.57
75	5.31	5.36	5.12	4.92	5.33	5.26
100	3.68	4.18	4.50	3.88	4.53	4.36
125	2.79	2.76	3.71	2.77	2.59	3.53
150	2.44	2.61	2.86	2.75	2.76	2.75
175	2.29	2.69	2.61	2.33	2.48	2.83
190	2.24	2.28	2.48	-	-	-
200			2.29	2.38	2.34	2.33

DISSOLVED OXYGEN CONTENT (ML/L)

STATION IDENTIFICATION:

CRUISE IDENTIFICATION

	02	08	21	07	11	02
DEPTH (M)	14A SEP	14 SEP	12 MAY	12 MAY	12 MAY	14B SEP
0	6.38	6.20	6.96	6.84	8.11	6.38
10	6.36	6.12	7.07	6.86	7.82	6.36
20	6.29	6.13	6.88	6.85	7.17	6.29
30	5.76	5.77	6.71	6.75	6.96	5.76
50	5.15	5.26	6.20	6.55	6.54	5.15
75	5.11	5.01	4.97	5.54	5.1	5.11
100	4.23	4.68	4.24	4.71	3.82	4.23
125	3.68	3.58	3.20	4.00	3.47	3.68
150	2.93	3.01	2.76	3.52	3.21	2.93
175	2.74	2.61	2.24	-	-	2.74
200	-	2.57	2.05	-	-	-
250	-	1.88	1.77	2.33	-	-
300	-	-	-	-	-	-
350	-	-	-	1.73	-	-
400	-	-	-	0.81	-	-
450	-	-	-	0.52	-	-
500	-	-	-	0.39	-	-

DISSOLVED OXYGEN CONTENT (ML/L)

STATION IDENTIFICATION: SD01

CRUISE IDENTIFICATION

DEPTH (M)	77			
	12A MAY	12B MAY	13 JUL	14 SEP
0	6.45	5.89	6.47	5.96
10	6.45	5.75	5.19	5.89
20	6.27	6.04	5.06	5.77
30	5.73	6.30	4.98	5.63
50	5.22	5.88	4.22	5.17
75	3.85	4.37	3.29	4.38
100	2.87	3.93	2.80	3.52
125	-	-	2.26	-

STATION IDENTIFICATION: SD06

CRUISE IDENTIFICATION

DEPTH (M)	77	
	13 JUL	14 SEP
0	6.69	6.17
10	6.66	6.09
20	6.42	6.10
30	5.56	5.62
50	5.36	5.55
75	4.90	4.79
100	3.79	5.15
125	3.82	3.97
150	3.16	1.38
175	3.30	2.80
200	3.12	2.64
250	2.18	2.52
300	1.42	2.18
350	1.12	2.11
400	0.82	-

DISSOLVED OXYGEN CONTENT (ML/L)

STATION IDENTIFICATION: RD10

CRUISE IDENTIFICATION

DEPTH	13	14
(M)	JUL	SEP
0	6.69	6.26
10	6.67	6.34
20	6.59	6.06
30	5.76	5.39
50	5.02	4.45
75	4.21	3.91
100	4.17	3.32
125	3.85	3.28
150	2.99	2.81
175	2.68	2.38
200	2.56	2.28
250	2.04	1.99
300	1.65	1.81
350	1.45	1.62

STATION IDENTIFICATION: RD13

CRUISE IDENTIFICATION

DEPTH	13	14
(M)	JUL	SEP
0	6.57	6.11
10	6.56	6.05
20	6.56	6.05
30	6.19	5.84
50	5.57	4.03
75	5.26	3.33
100	4.75	2.83
125	2.65	2.63
150	2.06	2.36
175	1.76	2.25
200	1.64	2.16

DISSOLVED OXYGEN CONTENT (ML/L)

STATION IDENTIFICATION: 0016

CRUISE IDENTIFICATION

DEPTH (M)	13 JUL	14 SEP	77
0	6.63	6.11	
10	6.53	5.55	
20	6.39	4.95	
30	6.27	4.46	
50	5.70	4.18	
75	4.32	3.68	
100	3.22	2.76	
125	2.46	1.91	
150	-	1.75	

STATION IDENTIFICATION: 0022

CRUISE IDENTIFICATION

DEPTH (M)	13 JUL	14 SEP	77
0	6.56	6.47	
10	6.50	6.50	
20	6.28	5.85	
30	6.16	5.23	
50	5.62	4.47	
75	4.32	3.97	
100	3.53	3.61	
125	3.21	3.02	
150	2.87	2.56	
175	2.32	2.25	
200	3.13	2.35	

APPENDIX D

Listings of nutrient data: nitrate, phosphate and silicate.

For each cruise, only one nutrient cast was taken at a specific station. Presented are the average values for each depth derived from duplicate samples at that depth drawn from the same water bottle. Samples which were prematurely thawed or showed evidence of salt extrusion have been omitted. Nutrient samples collected during cruise 77-13 were accidentally thawed for two days in a closed freezer and have been omitted.

Nutrient Data

Station QD01
Cruise 77-12 17 May 1977

Depth	Nitrate	Phosphate	Silicate
0	20.1	1.88	34.7
10	17.6	1.79	31.2
20	17.0	1.67	29.1
30	20.0	1.83	35.1

Nutrient Data: Nitrate ($\mu\text{g at/L}$)

Cruise 77-14 September 1977

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STATION NAME

Depth (m)	QD01	QD02	QD06	QD08	QD10	QD13	QD16	QD22	QD91
0	11.7	4.3	6.1	2.5	2.8	4.5	8.2	5.3	7.8
10	12.1	3.9	3.2	2.5	2.4	4.1	11.2	5.2	10.0
20	13.0	4.3	2.9	2.6	3.8	4.3	16.2	6.2	16.7
30	12.6	8.7	9.9	8.0	9.4	6.3	18.1	12.4	19.9
50	16.3	14.8	13.2	15.2	18.7	18.6	20.6	19.3	24.3
75	22.8	18.7	20.0	19.6	22.6	26.9	24.1	27.1	
100	31.2	26.2	20.5	23.4	28.3	30.1	29.0	28.0	
125	-	28.7	26.3	27.8	30.6	28.3	32.5	30.7	
150	-	31.8	29.6	29.4	34.8	34.8	32.3	31.9	
175	-	32.1	31.8	32.4	35.0	33.7	-	36.2	
200	-	-	34.8	32.0	35.7	34.0	-	36.9	
250	-	-	33.0	36.4	37.6	-	-	-	
300	-	-	35.2	-	-	-	-	-	
350	-	-	35.2	-	37.9	-	-	-	

Nutrient Data: Phosphate ($\mu\text{g at/L}$)

Cruise 77-14 September 1977

STATION NAME

Depth (m)	QD01	QD02	QD06	QD08	QD10	QD13	QD16	QD22	QD91
0	1.34	0.80	-	0.71	0.67	0.85	1.41	0.60	1.23
10	1.33	0.82	0.70	0.77	0.65	0.83	1.48	0.55	1.40
20	1.39	0.82	0.77	0.73	0.70	0.85	1.66	1.03	1.71
30	1.48	1.17	1.23	1.27	1.13	0.92	1.90	1.51	1.81
50	1.60	1.51	1.49	1.73	1.81	2.03	1.93	1.99	2.27
75	2.07	1.71	1.77	1.83	2.06	2.36	2.19	2.24	-
100	2.34	2.14	1.88	2.04	2.35	2.33	2.61	2.38	-
125	-	2.29	2.39	2.30	2.37	2.66	2.90	2.60	-
150	-	2.49	2.49	2.50	2.40	2.74	2.90	2.63	-
175	-	2.63	2.63	2.63	2.75	2.75	-	2.73	-
200	-	-	2.57	2.73	2.79	2.89	-	2.88	-
250	-	-	2.73	2.94	2.78	-	-	-	-
300	-	-	2.84	-	2.69	-	-	-	-
350	-	-	2.91	-	3.02	-	-	-	-

Nutrient Data: Silicate ($\mu\text{g at/L}$)

Cruise 77-14 September 1977

STATION NAME

Depth (m)	QD01	QD02	QD06	QD08	QD10	QD13	QD16	QD22	QD91
0	20.4	13.9	12.0	13.1	13.3	15.3	21.4	13.3	16.5
10	20.3	13.4	12.5	12.7	13.4	15.2	25.1	12.9	19.9
20	22.8	13.8	13.6	13.1	13.8	16.8	31.0	17.6	28.8
30	23.1	17.3	17.0	16.9	20.3	15.9	31.4	23.0	33.9
50	27.6	24.0	19.8	23.7	30.7	30.2	36.1	32.2	42.7
75	37.3	26.6	29.8	28.8	38.4	44.9	42.5	42.9	-
100	51.2	37.9	28.8	34.3	48.8	52.9	49.0	45.2	-
125	-	41.5	38.4	42.4	49.9	52.6	62.7	52.4	-
150	-	48.7	44.8	45.3	58.5	57.2	61.5	56.9	-
175	-	51.1	50.0	56.2	61.3	59.8	-	65.1	-
200	-	-	51.4	55.2	60.4	60.6	-	64.8	-
250	-	-	51.7	66.2	66.6	-	-	-	-
300	-	-	59.7	-	75.0	-	-	-	-
350	-	-	60.3	-	74.7	-	-	-	-

